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LAND RESOURCE INVENTORY AND SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS FOR WATERSHED PLANNING AND DEVELOPMENT

HALIGER-2 (4D4A1T1b) & HALIGER-3 (4D4A1T1a) MICRO WATERSHED

Alavandi Hobli, Koppal Taluk and District, Karnataka

Karnataka Watershed Development Project – II

SUJALA – III

World Bank funded Project

The World Bank

ICAR – NATIONAL BUREAU OF SOIL SURVEY AND LAND USE PLANNING

ICAR - NBSS & LUP

WATERSHED DEVELOPMENT DEPARTMENT
GOVT. OF KARNATAKA, BANGALORE

About ICAR - NBSS&LUP

The ICAR-National Bureau of Soil Survey and Land Use Planning (ICAR-NBSS&LUP), Nagpur, a premier Institute of the Indian Council of Agricultural Research (ICAR), was set up during 1976 with the objective to prepare soil resource maps at national, state and district levels and to provide research inputs in soil resource mapping and its applications, land evaluation, land use planning, land resource management, and database management using GIS for optimising land use on different kinds of soils in the country.

The Bureau has been engaged in carrying out soil resource survey, agro-ecological and soil degradation mapping at the country, state and district levels for qualitative assessment and monitoring the soil health towards viable land use planning. The research activities have resulted in identifying the soil potentials and problems, and the various applications of the soil surveys with the ultimate objective of sustainable agricultural development. The Bureau has the mandate to correlate and classify soils of the country and maintain a National Register of all the established soil series. The Institute is also imparting in-service training to staff of the soil survey agencies in the area of soil survey, land evaluation and soil survey interpretations for land use planning. The Bureau in collaboration with Panjabrao Krishi Vidyapeeth, Akola is running post-graduate teaching and research programme in land resource management, leading to M.Sc. and Ph.D. degrees.

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PREFACE

In Karnataka, as in other Indian States, the livelihoods of rural people are intertwined with farming pursuits. Thechallenges in agriculture are seriously threatening the livelihood of a large number of farmers as they have been practicing farming in contextual factors beyond their control. Climatic factors are the most important ones and have become much more significant in recent times due to rapid climate changes induced by intensive anthropogenic activities affecting our ecosystem in multiple ways. Climate change has become the reality, it is happening and efforts to evolve and demonstrate climate resilient technologies have become essential. Due to the already over stressed scenario of agrarian sector, the climate change is resulting in manifold increase in the complexities, pushing the rural mass to face more and more unpredictable situations. The rising temperatures and unpredictable rainfall patterns are going to test seriously the informed decisions farmers have to make in order to survive in farming and sustain their livelihood.

It is generally recognized that impacts of climate change shall not be uniform across the globe. It is said that impact of climate change is more severe in South Asia. Based on the analysis of meteorological data, it is predicted that in India, there will be upward trend in mean temperature, downward trend in relative humidity, annual rainfall and number of wet days in a year. Also, in general, phenomena like erratic monsoon, spread of tropical diseases, rise in sea levels, changes in availability of fresh water, frequent floods, droughts, heat waves, storms and hurricanes are predicted. Each one of these adverse situations are already being experienced in various parts of India and also at the global level. Decline in agricultural productivity of small and marginal farmers becoming more vulnerable is already witnessed.

In Karnataka, more than 60 per cent of the population live in rural areas and depend on agriculture and allied activities for their livelihood. Though the state has achieved significant progress in increasing the yield of many crops, there is tremendous pressure on the land resources due to the growing and competing demands of various land uses. This is reflected in the alarming rate of land degradation observed. Already more than 50 per cent of the area is affected by various forms of degradation. If this trend continues, the sustainability of the fragile ecosystem will be badly affected. The adverse effects of change in the climatic factors are putting additional stress on the land resources and the farmers dependent on this.

The natural resources (land, water and vegetation) of the state need adequate and constant care and management, backed by site-specific technological interventions and investments particularly by the government. Detailed database pertaining to the nature of

the land resources, their constraints, inherent potentials and suitability for various land based rural enterprises, crops and other uses is a prerequisite for preparing location-specific action plans, which are in tune with the inherent capability of the resources. Any effort to evolve climate resilient technologies has to be based on the baseline scientific database. Then only one can expect effective implementation of climate resilient technologies, monitor the progress, make essential review of the strategy, and finally evaluate the effectiveness of the implemented programs. The information available at present on the land resources of the state are of general nature and useful only for general purpose planning. Since the need of the hour is to have site-specific information suitable for farm level planning and detailed characterization and delineation of the existing land resources of an area into similar management units is the only option.

ICAR-NBSS&LUP, Regional Centre, Bangalore has taken up a project sponsored by the Karnataka Watershed Development Project-II, (Sujala-III), Government of Karnataka funded by the World Bank under Component -1 Land Resource Inventry. This study was taken up to demonstrate the utility of such a database in reviewing, monitoring and evaluating all the land based watershed development programs on a scientific footing. To meet the requirements of various land use planners at grassroots level, the present study on "Land Resource Inventory and Socio-Economic Status of Farm Households for Watershed Planning and Development of for Haligeri-2 & Haligeri-3 microwatersheds in Koppal Taluk, and District, Karnataka" for integrated development was taken up in collaboration with the State Agricutural Universities, IISC, KSRSAC, KSNDMC as Consortia partners. The project provides detailed land resource information at cadastral level (1:7920 scale) for all the plots and socio-economic status of farm households covering thirty per cent farmers randomely selected representing landed and landless class of farmers in the micro-watershed. The project report with the accompanying maps for the microwatersheds will provide required detailed database for evolving effective land use plan, alternative land use options and conservation plans for the planners, administrators, agricutural extention personnel, KVK officials, developmental departments and other land users to manage the land resources in a sustainable manner.

It is hoped that this database will be useful to the planners, administrators and developmental agencies working in the area in not only for formulating location specific developmental schemes but also for their effective monitoring at the village/watershed level.

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PART-A

LAND RESOURCE INVENTORY

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EXECUTIVE SUMMARY

The land resource inventory of Haligeri-2 & Haligeri-3 microwatersheds was conducted using village cadastral maps and IRS satellite imagery on 1:7920 scale. The false colour composites of IRS imagery were interpreted for physiography and these physiographic delineations were used as base for mapping soils. The soils were studied in several transects and a soil map was prepared with phases of soil series as mapping units. Random checks were made all over the area outside the transects to confirm and validate the soil map unit boundaries. The soil map shows the geographic distribution and extent, characteristics, classification, behavior and use potentials of the soils in the microwatersheds.

The present study covers an area of 509 ha in Koppal taluk and district, Karnataka. The climate is semiarid and categorized as drought - prone with an average annual rainfall of 662 mm, of which about 424 mm is received during south –west monsoon, 161 mm during north-east and the remaining 77 mm during the rest of the year. An area of about 93 per cent is covered by soils, 7 per cent by water bodies, settlements and others. The salient findings from the land resource inventory are summarized briefly below.

- *The soils belong to 6 soil series and 9 soil phases (management units) and 4 land use classes.*
- *The length of crop growing period is <90 days and starts from 2nd week of August to 2nd week of November.*
- *From the master soil map, several interpretative and thematic maps like land capability, soil depth, surface soil texture, soil gravelliness, available water capacity, soil slope and soil erosion were generated.*
- *Soil fertility status maps for macro and micronutrients were generated based on the surface soil samples collected at every 250 m grid interval.*
- *Land suitability for growing 28 major agricultural and horticultural crops were assessed and maps showing the degree of suitability along with constraints were generated.*
- *Entire area is suitable for agriculture.*
- *About 38 per cent of the soils are shallow (25-50 cm), 20 per cent are moderately shallow (50-75 cm), 34 per cent of the soils are moderately deep (75-100 cm) and <1 per cent are deep soils (100-150 cm) in soils.*
- *About 73 per cent area has clayey soils at the surface and 20 per cent area has loamy soils.*
- *About 25 per cent of the area has non-gravelly (<15%) soils, 41 per cent gravelly soils (15-35 % gravel) and 27 per cent very gravelly (35- 60% gravel) soils.*
- *About 72 per cent are low (51-100 mm/m) and 21 per cent are medium (101-150 mm/m) in available water capacity.*

- *About 1 per cent area has nearly level (0-1%) and 92 per cent area has very gently sloping (1-3%) lands.*
- *An area of about 20 per cent has soils that are slightly eroded (e1) and 73 per cent moderately eroded (e2) lands.*
- *An area of <1 per cent soils are neutral (pH 6.5-7.3), 18 per cent are slightly alkaline (pH 7.3-7.8), 23 per cent are moderately alkaline (pH 7.8-8.4), 34 per cent are strongly alkaline (pH 8.4-9.0) and 18 per cent are very strongly alkaline (pH > 9.0) soils.*
- *The Electrical Conductivity (EC) of the entire soils is <2 dS m^{-1} and as such the soils are non-saline.*
- *Organic carbon content is low (<0.5%) in about 16 per cent and medium (0.5-0.75%) in 77 per cent of the soils.*
- *Available phosphorus is low (<23 kg/ha) in about 25 per cent and medium (23-57 kg/ha) in about 68 per cent area of the microwatersheds.*
- *About 21 per cent of the soils are medium (145-337 kg/ha) and 72 per cent of the soils are high (>337 kg/ha) in available potassium content.*
- *Available sulphur is low (<10 ppm) in about 38 per cent, medium (10-20 ppm) in 19 per cent and about 36 per cent area is high (>20 ppm).*
- *Available boron is medium (0.5-1.0 ppm) in about 45 per cent and high (>1.0 ppm) in about 48 per cent area.*
- *Available iron is sufficient (>4.5 ppm) in 20 per cent and deficient (<4.5 ppm) in 73 per cent area.*
- *Available zinc is deficient (<0.6 ppm) in 77 per cent and sufficient (>0.6 ppm) in about 16 per cent area.*
- *Available manganese and copper are sufficient in all the soils.*
- *The land suitability for 28 major crops grown in the microwatersheds were assessed and the areas that are highly suitable (S1) and moderately suitable (S2) are given below. It is however to be noted that a given soil may be suitable for various crops but what specific crop to be grown may be decided by the farmer looking to his capacity to invest on various inputs, marketing infrastructure, market price and finally the demand and supply position.*

Land suitability for various crops in the microwatersheds

Crop	Suitability Area in ha (%)			Crop	Suitability Area in ha (%)	
	Highly suitable (S1)	Moderately suitable (S2)			Highly suitable (S1)	Moderately suitable (S2)
Sorghum	*105 (21)*	*139 (27)*		*Pomegranate*	-	*142 (28)*
Maize	-	*147 (29)*		*Guava*	-	*78 (15)*
Bajra	*43 (8)*	*103 (20)*		*Jackfruit*	-	*78 (15)*
Red gram	-	*142 (28)*		*Jamun*	-	*78 (15)*
Bengalgram	*98 (19)*	*146 (29)*		*Musambi*	-	*141 (28)*
Groundnut	*1 (<1)*	*180 (35)*		*Lime*	-	*176 (35)*
Sunflower	-	*177 (35)*		*Cashew*	-	*77 (15)*
Cotton	*98 (19)*	*146 (29)*		*Custard apple*	*141 (28)*	*138 (27)*
Chilli	*42 (8)*	*104 (20)*		*Amla*	*43 (8)*	*237 (46)*
Tomato	*42 (8)*	*104 (20)*		*Tamarind*	-	*1 (<1)*
Drumstick	-	*141 (28)*		*Marigold*	-	*245 (48)*
Mulbery	*1 (<1)*	*176 (34)*		*Chrysanthemum*	-	*245 (48)*
Mango	-	*1 (<1)*		*Jasmine*	-	*146 (29)*
Sapota	-	*43 (8)*		*Crossandra*	-	*146 (29)*

Apart from the individual crop suitability, a proposed crop plan has been prepared for the 4 identified LUCs by considering only the highly and moderately suitable lands for different crops and cropping systems with food, fodder, fibre and other horticulture crops that helps in maintaining productivity and ecological balance in the microwatersheds.

- *Maintaining soil-health is vital to crop production and conserve soil and land resource base for maintaining ecological balance and to mitigate climate change. For this, several ameliorative measures have been suggested for these problematic soils like saline/alkali, highly eroded, sandy soils etc.,*
- *Soil and water conservation treatment plan has been prepared that would help in identifying the sites to be treated and also the type of structures required.*
- *As part of the greening programme, several tree species have been suggested to be planted in marginal and submarginal lands, field bunds and also in the hillocks, mounds and ridges. That would help in supplementing the farm income, provide fodder and fuel, and generate lot of biomass which in turn would help in maintaining the ecological balance and contribute to mitigating the climate change.*

Chapter 1

INTRODUCTION

Land is a scarce resource and basic unit for any material production. It can support the needs of the growing population, provided they use the land in a rational and judicious manner. But what is happening in many areas of the state is a cause for concern to everyone involved in the management of land resources at the grassroots level. The area available for agriculture is about 51 per cent of the total area and more than 60 per cent of the people are still dependant on agriculture for their livelihood. The limited land area is under severe stress and strain due to increasing population pressure and competing demands of various land uses. Due to this, every year there is significant diversion of farm lands and water resources for non-agricultural purposes. Apart from this, due to lack of interest in farmers for farming, large tracts of cultivable lands are turning into fallows in many areas and this trend is continuing at an alarming rate.

Further, land degradation has emerged as a serious problem which has already affected about 38 lakh ha of cultivated area in the state. Soil erosion alone has degraded about 35 lakh ha. Almost all the uncultivated areas are facing various degrees of degradation, particularly soil erosion. Salinity and alkalinity has emerged as a major problem in more than 3.5 lakh ha in the irrigated areas of the state. Nutrient depletion and declining factor productivity is common in both rainfed and irrigated areas. The degradation is continuing at an alarming rate and there appears to be no systematic effort among the stakeholders to contain this process. In recent times, an aberration of weather due to climate change phenomenon has added another dimension leading to unpredictable situations to be tackled by the farmers.

In this critical juncture, the challenge before us is not only to increase the productivity per unit area which is steadily declining and showing a fatigue syndrome, but also to prevent or at least reduce the severity of degradation. If the situation is not reversed at the earliest, then the sustainability of the already fragile crop production system and the overall ecosystem will be badly affected in the state.

The continued neglect and unscientific use of the resources for a long time has led to the situation observed at present in the state. It is a known fact and established beyond doubt by many studies in the past that the cause for all kinds of degradation is the neglect and irrational use of the land resources. Hence, there is urgent need to generate a detailed site-specific farm level database on various land resources for all the villages/watersheds in a time bound manner that would help to protect the valuable soil and land resources and also to stabilize the farm production.

Therefore, the land resource inventory required for farm level planning is the one which investigates not only the surface but also consider the other parameters which are critical for productivity *viz.*, soils, climate, water, minerals and rocks, topography, geology, hydrology, vegetation, crops, land use pattern, animal population, socio-economic conditions, infrastructure, marketing facilities and various schemes and

developmental works of the government etc. From the data collected at farm level, the specific problems and potentials of the area can be identified and highlighted, conservation measures required for the area can be planned on a scientific footing, suitability of the area for various uses can be worked out and finally viable and sustainable land use options suitable for each and every land holding can be prescribed.

The Land Resource Inventory is basically done for identifying potential and problem areas, developing sustainable land use plans, estimation of surface run off and water harvesting potential, preparation of soil and water conservation plans, land degradation/desertification etc. The Bureau is presently engaged in developing an LRI methodology using high resolution satellite remote sensing data and Digital Elevation Model (DEM) data to prepare Landscape Ecological Units (LEU) map representing agro-ecosystem as a whole. The LEU is preferred over landform as the base map for LRI. LEU is the assemblage of landform, slope and land use. An attempt was made to upscale the soil resource information from 1:250000 and 1:50000 scale to the LEU map in Goa and other states.

The land resource inventory aims to provide site specific database for Haligeri-2 & Haligeri-3 microwatersheds in Koppal Taluk, Koppal District, KarnatakaState for the Karnataka Watershed Development Department. The database was generated by using cadastral map of the village as a base along with high resolution IRS LISS IV and Cartosat-1 merged satellite imagery. Later, an attempt will be made to uplink this LRI data generated at 1:7920 scale under Sujala-III Project to the proposed Landscape Ecological Units (LEUs) map.

The study was organized and executed by the ICAR- National Bureau of Soil Survey and Land Use Planning, Regional Centre, Bangalore under Generation of Land Resource Inventory Data Base Component-1 of the Sujala-III Project funded by the World Bank.

Chapter 2

GEOGRAPHICAL SETTING

2.1 Location and Extent

The Haligeri-2 & Haligeri-3 Microwatershedsare located in the central part of northern Karnataka in Koppal Taluk, Koppal District, Karnataka State (Fig.2.1). It comprisesof Halageri villages. It lies between $15^0$22' – $15^0$23' North latitudes and $75^0$05'–$76^0$03' East longitudesand covers an area of 509 ha. It is surrounded byHalagerivillage on theeast, south and Yelburga talukonthe west and northern side.

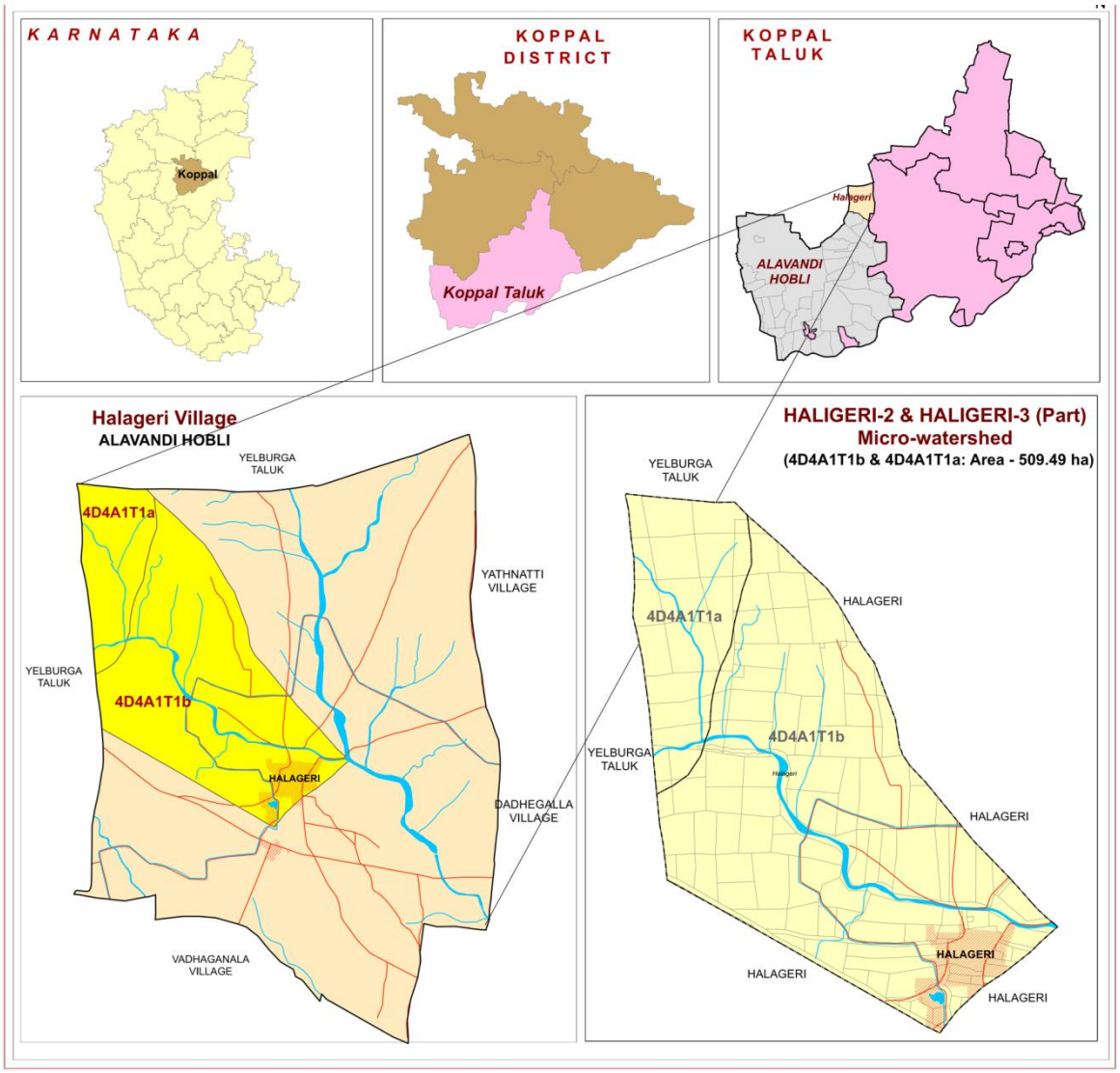

Fig.2.1 Location map of Haligeri-2 & Haligeri-3 Microwatersheds

2.2 Geology

Major rock formations observed in the microwatersheds are granite gneiss and alluvium (Figs.2.2a and b). Granite gneisses are essentially pink to gray and are coarse to medium grained. They consist primarily of quartz, feldspar, biotite and hornblende. The gray granite gneisses are highly weathered, fractured and fissured upto a depth of about 10 m. Dolerite dykes and quartz veins are common with variable width and found to

occur in thevillage. The thickness of the alluvium generally is limited to less than a meter, except in river valleys where it is very deep extending to tens of meters. Such soils are transported and represent palaeo black soils originally formed at higher elevation, but now occupying river valleys.

Fig.2.2a Granite and granite gneiss rocks

Fig.2.2 b Alluvium

2.3 Physiography

Physiographically, the area has been identified as Granite gneiss and Alluvial landscapes based on geology. The microwatersheds area has been further divided into summits, very gently sloping uplands and nearly level plains based on slope and its relief features. The elevation ranges from 521 to 552 m in the gently sloping uplands.

2.4 Drainage

The area is drained by several small seasonal streams that join Hire *halla* and Chenna *halla*along its course. Though, the streams are not perennial, during rainy season they carry large quantities of rain water.The microwatershedshas only few small tanks which are not able to store the water flowing during the rainy season. Due to this, the ground water recharge is very much affected in the villages. This is reflected in the failure of many bore wells in the village. If the available rain water is properly harnessed by constructing tanks and recharge structures at appropriate places in the village, then the drinking and irrigation needs of the area can be easily met. The drainage network is dendritic to sub parallel.

2.5 Climate

The district falls under semiarid tract of the state and is categorized as drought-prone with an average annual rainfall of 662 mm (Table 2.1). Maximum of 424 mm precipitation takes place during the south-west monsoon period from June to September, north-east monsoon contributes about 161 mm and prevails from October to early December and the remaining 77 mm takes place during the rest of the year. The winter season is from December to February. During April and May, the temperatures reach up to 45°C and in December and January, the temperatures will go down to 16°C. Rainfall distribution is shown in Figure 2.3. The average Potential Evapo Transpiration (PET) is 145 mm and varies from a low of 101 mm in December to 193 mm in the month of May. The PET is always higher than precipitation in all the months except in the month of September. Generally, the Length of crop Growing Period (LGP) is <90 days and starts from 2nd week of August to 2nd week of November.

Table 2.1 Mean Monthly Rainfall, PET, 1/2 PET at Koppal Taluk and District

Sl.No.	Months	Rainfall	PET	1/2 PET
1	January	1.60	116.70	58.35
2	February	1.50	129.20	64.60
3	March	14.10	169.80	84.90
4	April	18.10	180.60	90.30
5	May	41.60	193.50	96.75
6	June	85.80	167.90	83.95
7	July	72.10	156.20	78.10
8	August	110.50	152.50	76.25
9	September	155.60	138.50	69.25
10	October	116.30	122.30	61.15
11	November	36.00	106.40	53.20
12	December	9.10	101.00	50.50
	TOTAL	**662.30**	**144.55**	

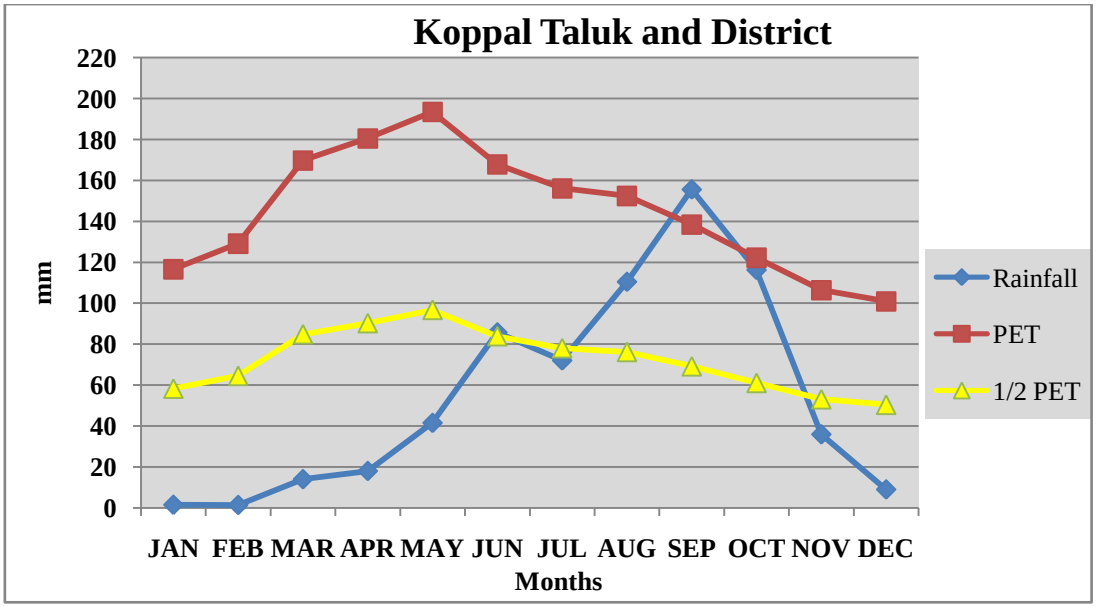

Fig. 2.3 Rainfall distribution in Koppal Taluk and District

2.6 Natural Vegetation

The natural vegetation is sparse comprising few tree species, shrubs and herbs. The mounds, ridges and boulders occupy sizeable areas which are under thin to moderately thick forest vegetation. Still, there are some remnants of the past forest cover which can be seen in patches in some ridges and hillocks in the microwatersheds Fig (2.4).

Apart from the continuing deforestation, the presence of large population of goats, sheep and other cattle in the microwatersheds is causing vegetative degradation of whatever little vegetation left in the area. The uncontrolled grazing has left no time for the regeneration of the vegetative cover. This leads to the accelerated rate of erosion on the hill slopes, resulting in the formation of deep gullies in the foot slopes and eventually resulting in the heavy siltation of few tanks and reservoirs in the microwatersheds.

Fig 2.4 Natural vegetation of Haligeri-2 & Haligeri-3 microwatersheds

2.7 Land Utilization

About 91 per cent area (Table 2.2) inKoppal district is cultivated at present and about 16 per cent of the area is sown more than once. The cropping intensity is 118 per cent. An area of about 3 per cent is currently barren. Forests occupy a small area of about 5 per cent and the tree cover is in a very poor state. Most of the mounds, ridges and bouldery areas have very poor vegetative cover. Major crops grown in the area are sorghum, maize, bajra, cotton, safflower, sunflower, red gram, horse gram, onion, mulberry, pomegranate, sugarcane, bengalgram and groundnut (Fig 2.5). While carrying out land resource inventory, the land use/land cover particulars are collected from all the survey numbers and a current land use map of the microwatersheds is prepared. The current land use map prepared shows the arable and non-arable lands, other land uses and different types of crops grown in the area. The current land use map of Haligeri-2 & Haligeri-3 microwatershedsis presented in Fig.2.6. Simultaneously, enumeration of existing wells (bore wells and open wells) and other soil and water conservation structures in the microwatersheds is made and their location in different survey numbers is marked on the cadastral map. Map showing the location of wells, soil conservation structures and other water bodies in Haligeri-2 & Haligeri-3 microwatershedsis given Fig.2.7

Table 2.2 Land Utilization in KoppalDistrict

Sl.No.	Agricultural land use	Area (ha)	Per cent
1	Total geographical area	552495	
2	Total cultivated area	500542	90.6
3	Area sown more than once	92696	16.8
4	Trees and groves	210	0.04
5	Cropping intensity	-	118
6	Forest	29451	5.33
7	Cultivable wasteland	2568	0.46
8	Permanent Pasture land	14675	2.66
9	Barren land	16627	3.01
10	Non agricultural land	40591	7.35
11	Current fallow	19660	3.56

Fig.2.5(a) Different crops and cropping systems in Haligeri-2 & Haligeri-3 Microwatersheds

Fig.2.5(b) Different crops and cropping systems in Haligeri-2 & Haligeri-3 Microwatersheds

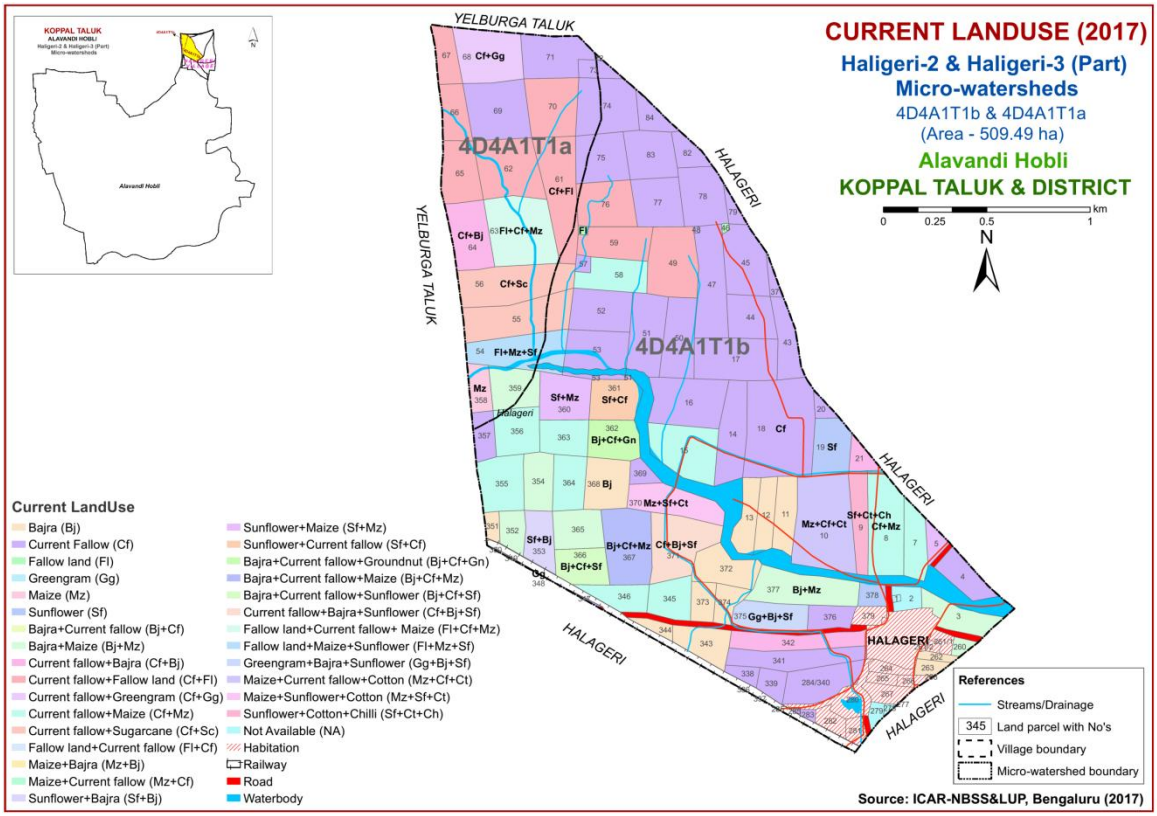

Fig.2.6 Current Land Use – Haligeri-2 & Haligeri-3 Microwatersheds

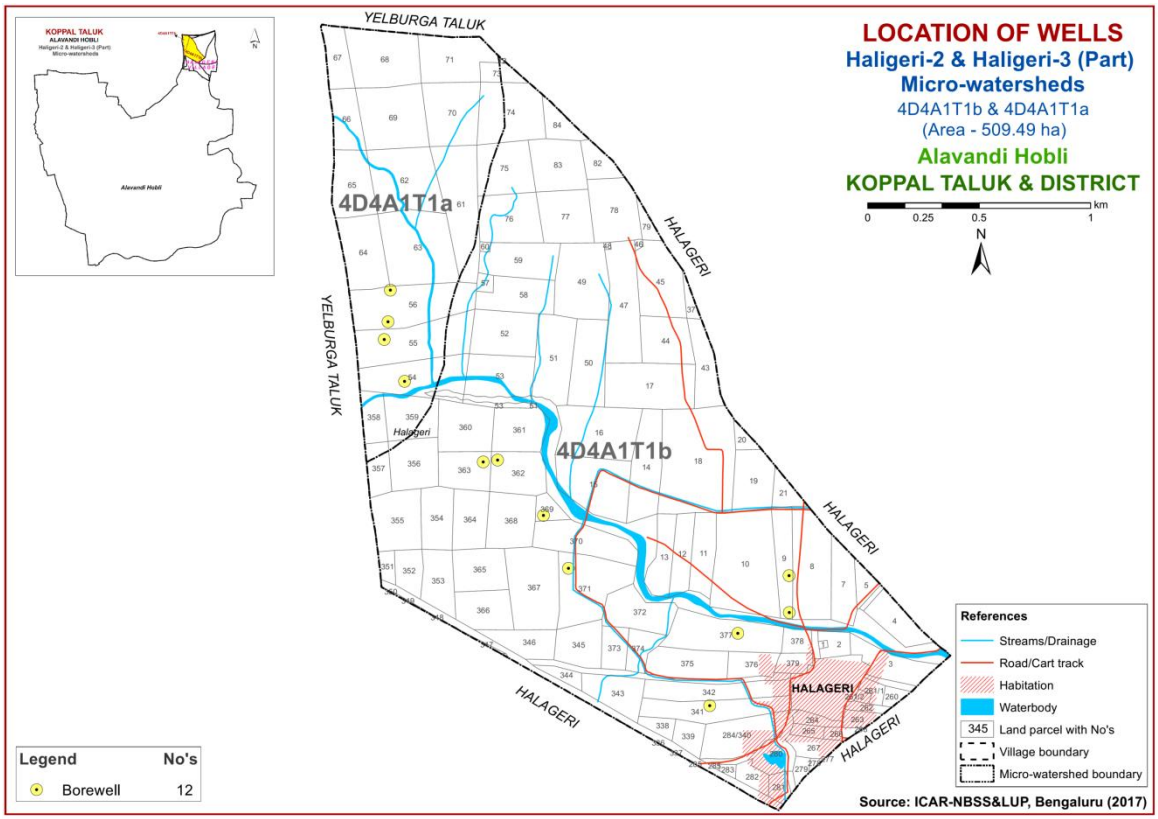

Fig.2.7 Location of wells-Haligeri-2 & Haligeri-3 Microwatersheds

Chapter 3

SURVEY METHODOLOGY

The purpose of land resource inventory is to delineate similar areas (soil series and phases), which respond or expected to respond similarly to a given level of management. This was achieved in Haligeri-2 & Haligeri-3 microwatersheds by the detailed study of all the soil characteristics (depth, texture, colour, structure, consistence, coarse fragments, porosity, soil reaction, soil horizons etc.) and site (slope, erosion, drainage, occurrence of rock fragments etc.) followed by grouping of similar areas based on soil-site characteristics into homogeneous (management units) units and showing their extent and geographic distribution on the microwatersheds cadastral map. The detailed soil survey at 1:7920 scale was carried out in 509 ha area. The methodology followed for carrying out land resource inventory was as per the guidelines given in Soil Survey Manual (IARI, 1971; Soil Survey Staff, 2006; Natarajan *et al.,* 2015) which is briefly described below.

3.1 Base Maps

The detailed survey of the land resources occurring in the microwatersheds was carried out by using digitized cadastral map as a base. The cadastral map shows field boundaries with their survey numbers, location of tanks, streams and other permanent features of the area (Fig. 3.1). Apart from the cadastral map, remote sensing data products from Cartosat-1 and LISS IV merged at the scale of 1:7920 were used in conjunction with the cadastral map to identify the geology, landscapes, landforms and other surface features. The imagery helped in the identification and delineation of boundaries between hills, uplands and lowlands, water bodies, forest and vegetated areas, roads, habitations and other cultural features of the area(Fig.3.2).The cadastral map was overlaid on the satellite imagery (Fig.3.3) that helps to identify the parcel boundaries and other permanent features. Apart from cadastral maps and images, toposheets of the area (1:50,000 scale) were used for initial traversing, identification of geology, landscapes and landforms, drainage features, present land use and also for selection of transects in the microwatersheds.

3.2 Image Interpretation for Physiography

False Colour Composites (FCC) of Cartosat-I and LISS-IV merged satellite data covering the microwatersheds area was visually interpreted using image interpretation elements and all the available collateral data with local knowledge. The delineated physiographic boundaries were transferred on to a cadastral map overlaid on satellite imagery. Physiographically, the area has been identified asgranite gneiss andalluvial landscapes and is divided into landforms such as uplands based on slope. They were further subdivided into physiographic/ image interpretation units based on image characteristics. The image interpretation legend for physiography is given below.

ImageInterpretationLegend for Physiography

G- Granite gneiss landscape

G1 Hills/ Ridges/ Mounds

G11 Summits

G12 Side slopes

G121 Side slopes with dark grey tones

G2 Uplands

G21 Summits

G22 Gently sloping uplands

G221 Gently sloping uplands, yellowish green (eroded)

G222 Gently sloping uplands, yellowish white (severely eroded)

G23 Very gently sloping uplands

G231 Very gently sloping uplands, yellowish green

G232 Very gently sloping uplands, medium green and pink

G233 Very gently sloping uplands, pink and green (scrub land)

G234 Very gently sloping uplands, medium greenish grey

G235 Very gently sloping uplands, yellowish white (eroded)

G236 Very gently sloping uplands, dark green

G237 Very gently sloping uplands, medium pink (coconut garden)

G238 Very gently sloping uplands, pink and bluish white (eroded)

DSe Alluvial landscape

DSe1 Summit

DSe11 Nearly level Summit with dark grey tone

DSe12 Nearly level Summit with medium grey tone

DSe13 Nearly level Summit with whitish grey tone

DSe14Nearly level Summit with whitish tone (Calcareousness)

DSe15 Nearly level Summit with pinkish grey tone

DSe16 Nearly level Summit with medium pink tone

DSe17 Nearly level Summit with bluish white tone

DSe 18 Nearly level Summit with greenish grey tone

DSe2 Very genetly sloping

DSe21 Very gently sloping, whitish tone

DSe22Very gently sloping, greyish pink tone

DSe23Very gently sloping, whitish grey tone

DSe24Very gently sloping, medium grey tone

DSe25Very gently sloping, medium pink tone

DSe26 Very gently sloping, dark grey tone

DSe27 Very gently sloping, bluish grey tone

DSe28Very gently sloping, greenish grey tone

DSe 29 Very gently sloping, Pinkish grey

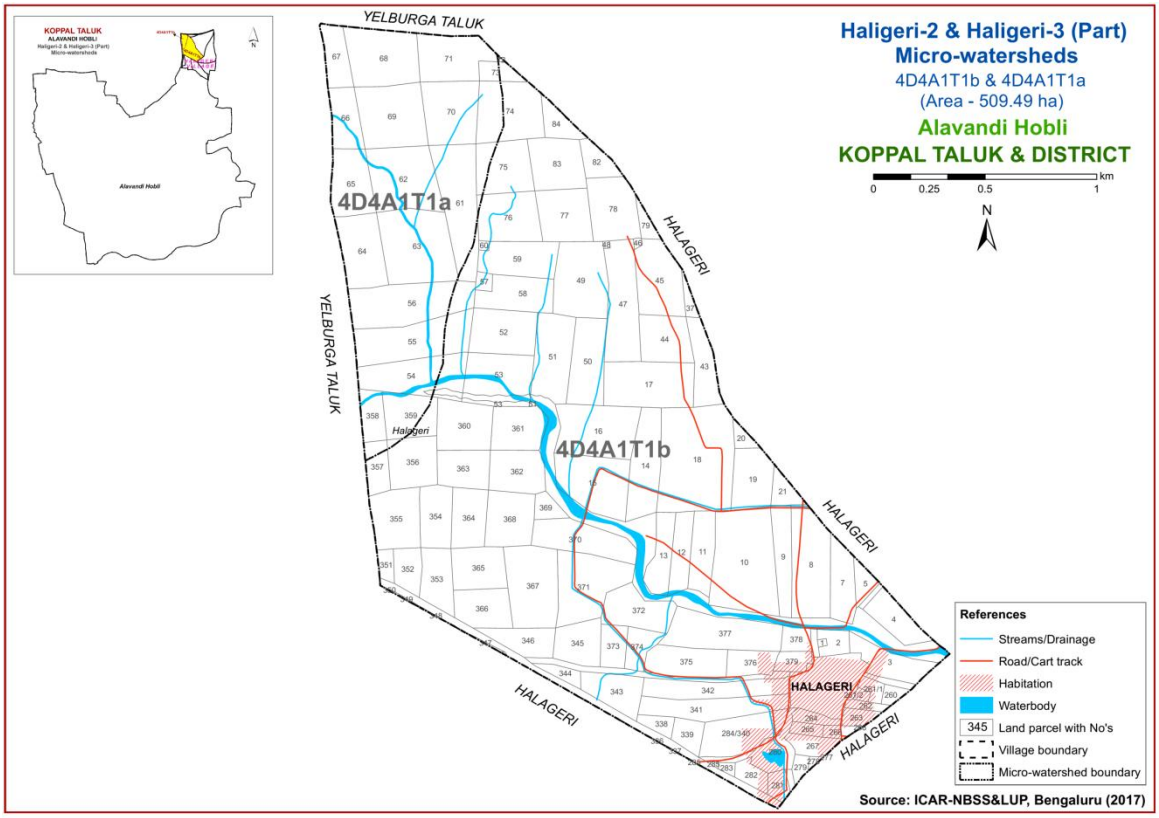

Fig. 3.1 Scanned and Digitized Cadastral map of Haligeri-2 & Haligeri-3Microwatersheds

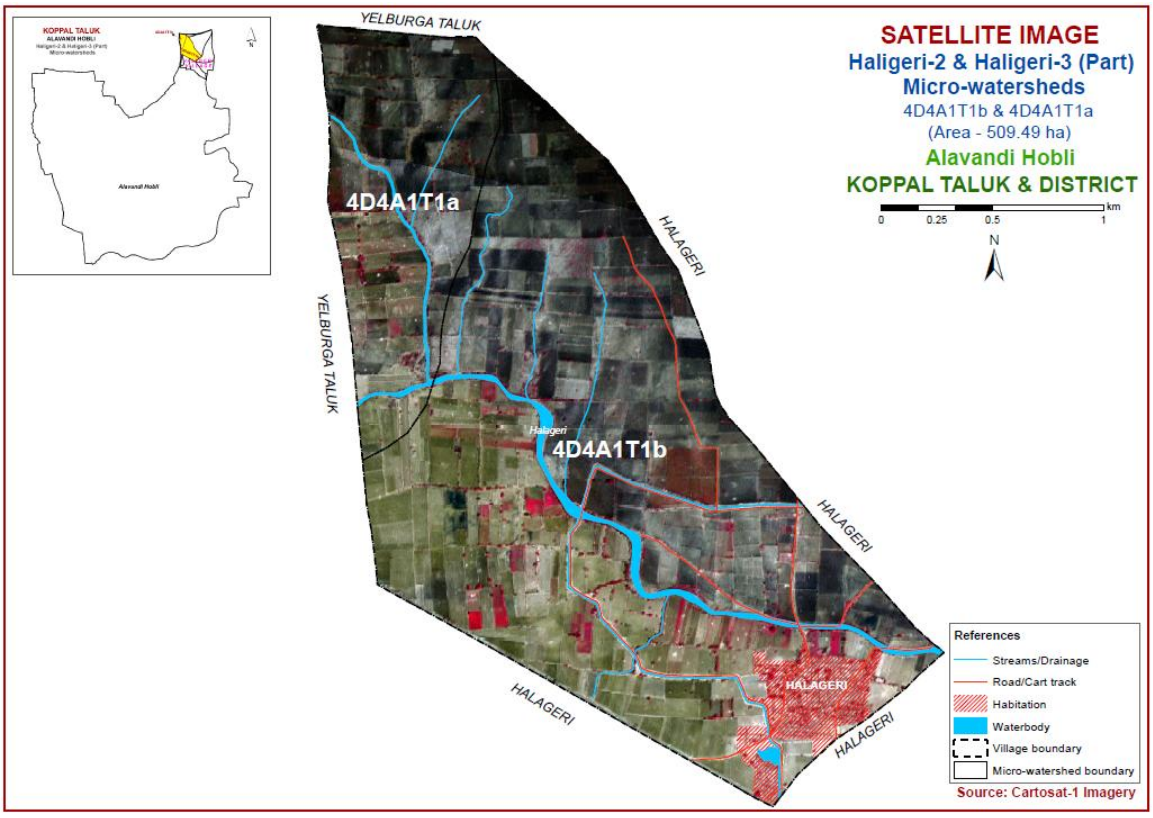

Fig.3.2 Satellite Image of Haligeri-2 & Haligeri-3 Microwatersheds

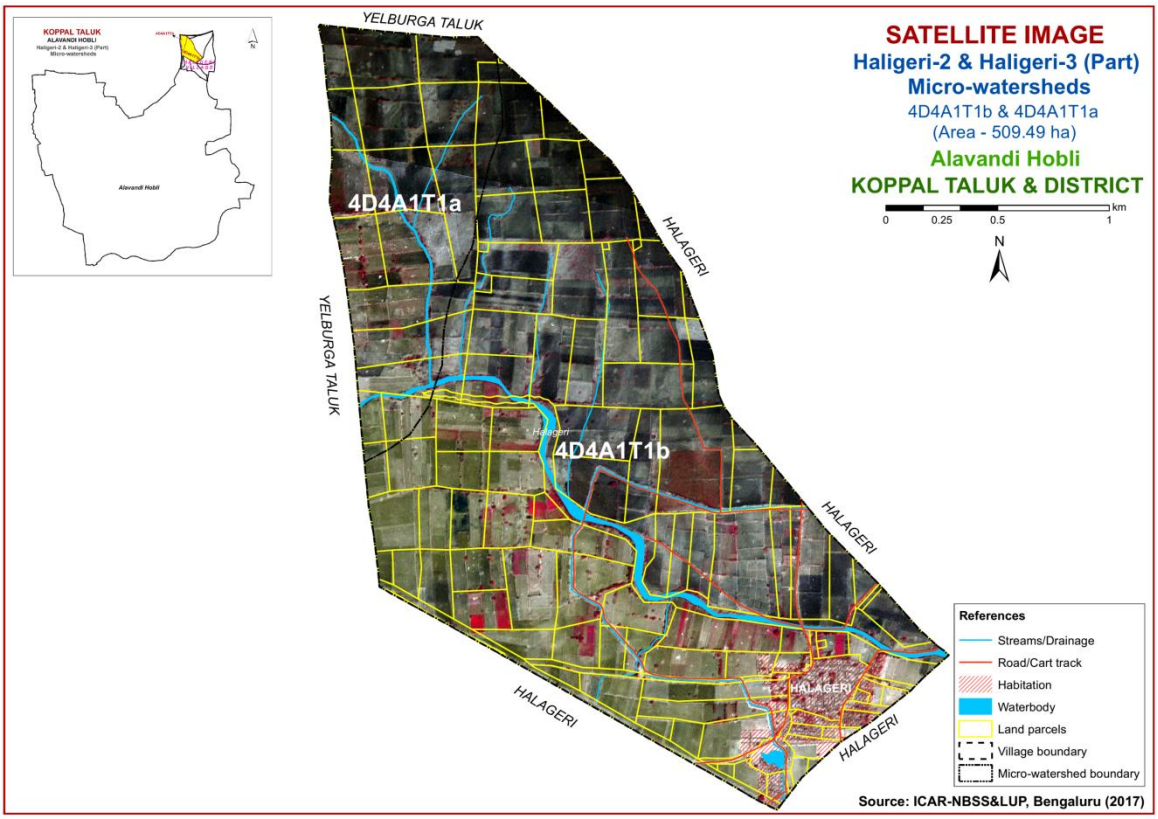

Fig.3.3Cadastral map overlaid on IRS PAN+LISS IV merged imagery of Haligeri-2 & Haligeri-3 Microwatersheds

3.3 Field Investigation

The field boundaries and survey numbers given on the cadastral sheet were located on the ground by following permanent features like roads, cart tracks, *nallas*, streams, tanks etc., and wherever changes were noticed, they were incorporated on the microwatersheds cadastral map.Preliminary traverse of the microwatersheds was carried out with the help of cadastral map, imagery and toposheets. While traversing, landforms and physiographic units identified were checked and preliminary soil legend was prepared by studying soils at few selected places.Then, intensive traversing of each physiographic unit like hills, ridges,uplands and plains was carried out. Based on the variability observed on the surface, transects (Fig. 3.4) were selected across the slope covering all the landform units in the microwatersheds (Natarajan and Dipak Sarkar, 2010).

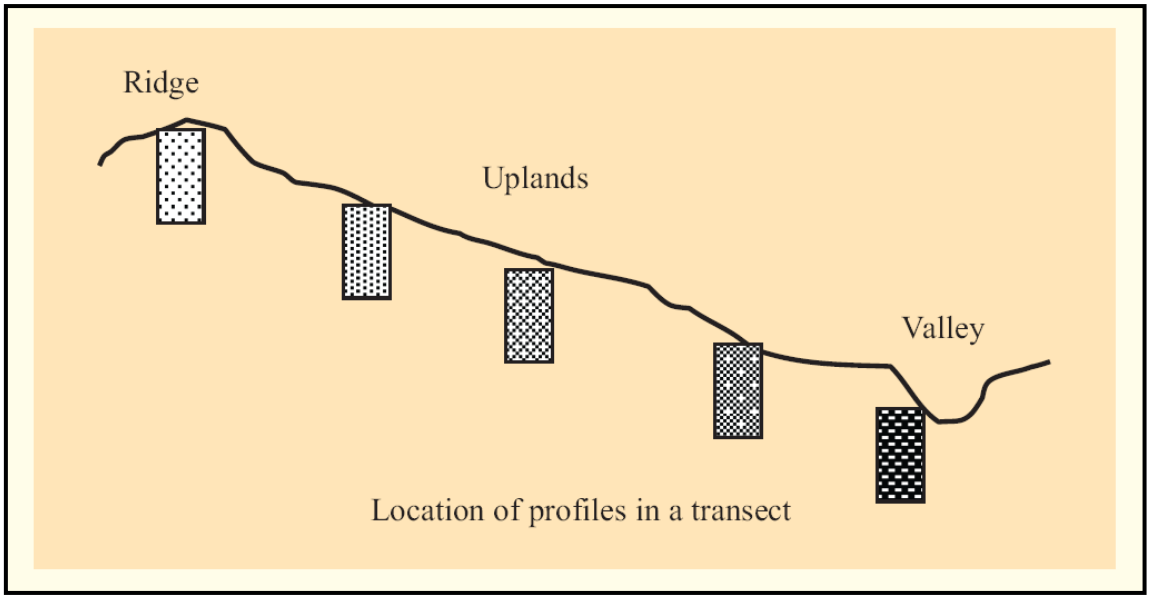

Fig. 3.4Location of profiles in a transect

In the selected transect, soil profiles (Fig.3.4) were located at closely spaced intervals to take care of any change in the land features like break in slope, erosion, gravel, stones etc. In the selected sites, soil profiles (vertical cut showing the soil layers from surface to the rock) were opened upto 200 cm or to the depth limited by rock or hard substratum and studied in detail for all their morphological and physical characteristics. The soil and site characteristics were recorded for all profile sites on a standard proforma as per the guidelines given in USDA Soil Survey Manual (Soil Survey Staff, 2012). Apart from the transect study, profiles were also studied at random, almost like in a grid pattern, outside the transect areas to validate the soil map unit boundaries.

Based on the soil characteristics, the soils were grouped into different soil series.Soil series is the most homogeneous unit having similar horizons and properties and behaves similarly for a given level of management. Soil depth, texture, colour, kind of horizon and horizon sequence, amount and nature of gravel present, calcareousness, nature of substratum etc, were used as the major differentiating characteristics for identifying soil series occurring in the area. The differentiating characteristics used for identifying the soil series are given in Table 3.1. Based on the above characteristics, 6 soil series were identified in Haligeri-2 & Haligeri-3Microwatersheds.

Table 3.1 Differentiating Characteristics used for identifying Soil Series (Characteristics are of Series Control Section)

Soils of Granite gneiss Landscape							
Sl. No	**Soil Series**	**Depth(cm)**	**Colour(moist)**	**Texture**	**Gravel (%)**	**Horizon sequence**	**Calcareo-usness**
1	Thammadahalli (TDH)	50-75	2.5YR2.5/4,3/6	sc-c	<15	Ap-Bt-Cr	-
2	Bisarahalli (BSR)	75-100	5 YR 3/3, 3/4	gsc	15-35	Ap-Bt-Cr	
3	Chikkamegheri (CKM)	75-100	2.5YR2.5/3,3/4, 3/6	sc	-	Ap-Bt-Cr	
4	Mornal (MNL)	100-150	5YR 3/4, 2.5 YR 3/4, 4/6	gsc-gscl	15-35	Ap-Bt-Cr	e
	Soils of Alluvial Landscape						
5	Muttal (MTL)	25-50	10YR3/2,3/3,4/2 7.5YR3/2,3/3,6/4	gc	15-35	Ap-Bw-Ck	e-ev
6	Narasapura (NSP)	75-100	10 YR 3/1, 3/2, 4/2,	c		Ap-Bw-Cr	e-es

3.4 Soil Mapping

The area under each soil series was further separated into 9 soil phases and their boundaries delineated on the cadastral map based on the variations observed in the texture of the surface soil, slope, erosion, presence of gravel, stoniness etc. A soil phase is a subdivision of soil series based mostly on surface features that affect its use and management.

The soil mapping units are shown on the soil map(Fig.3.5) in the form of symbols. During the survey manysoil profile pits, few minipits and a few auger bores representing different landforms occurring in the microwatersheds were studied. In addition to the profile study, spot observations in the form of minipits, road cuts, terrace cuts etc., were studied to validate the soil boundaries on the soil map.The soil map shows the geographic distribution of 9 mapping units representing 6 soil series occurring in the microwatersheds. The soil map unit (soil legend) description is presented in Table 3.2.The soil phase map (management units) shows the distribution of 9 phases mapped in the microwatersheds. Each mapping unit (soil phase) delineated on the map has similar soil and site characteristics. In other words, all the farms or survey numbers included in one phase will have similar management needs and have to be treated accordingly.

3.5Laboratory Characterization

Soil samples for each soil series were collected from representative master profiles for laboratory characterization by following the methods outlined in the Laboratory Manual (Sarma *et al*, 1987). Surface soil samples collected in the year 2017 from Haligeri-2 & Haligeri-3 farmer's fields (50 samples) for fertility status (major and micronutrients) at 250 m grid interval were analyzed in the laboratory (Katyal and Rattan, 2003). By linking the soil fertility data to the survey numbers through GIS, soil fertility maps were generated using Kriging method for the microwatersheds.

Table 3.2 Soil map unit description of Haligeri-2 & Haligeri-3 Microwatersheds

Soil map unit No*	Soil Series	Soil Phase Symbol	Mapping Unit Description	Area in ha (%)
Soils of Granite and Granite gneiss landscape				
	TDG	Thammadahalli soils are moderately shallow (50-75cm), well drained, have dark red to dark reddish brown red sandy clay to clay soils occurring on very gently sloping uplands under cultivation		**103 (20.22)**
59		TDHhB2g2	Sandy clay loam surface, slope 1-3%, moderate erosion, very gravelly (35-60%)	103 (20.22)
	BSR	Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly red sandy clay soils occurring on very gently sloping uplands under cultivation		**71 (13.83)**
165		BSRiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	36 (6.98)
166		BSRiB1g2	Sandy clay surface, slope 1-3%, slight erosion, very gravelly (35-60%)	35 (6.85)
	CKM	Chikkamegheri soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown red sandy clay soils occurring on nearly level to very gently sloping uplands under cultivation		**7 (1.33)**
177		CKMiA1	Sandy clay surface, slope 0-1%, slight erosion	7 (1.33)
	MNL	Mornal soils are deep (100-150 cm), well drained, have dark reddish brown to red slightly calcareous, gravelly sandy clay loam to sandy clay soils occurring on very gently sloping uplands under cultivation		**1 (0.14)**
207		MNLiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	1 (0.14)
Soils of Alluvial landscape				
	MTL	Muttal soils are shallow (25-50 cm), well drained, have very dark grayish brown to dark brown, calcareous black gravelly clay soils occurring on nearly level to gently sloping plains under cultivation		**195 (38.23)**
310		MTLmB2	Clay surface, slope 1-3%, moderate erosion	48 (9.46)
311		MTLmB2g1	Clay surface, slope 1-3%, moderate erosion, gravelly (15-35%)	147 (28.77)
	NSP	Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, black, calcareous, cracking clay soils occurring on nearly level to very gently sloping plains under cultivation		**99 (19.31)**
357		NSPiB1g1	Sandy clay surface, slope 1-3%, slight erosion, gravelly (15-35%)	24 (4.65)
362		NSPmB2	Clay surface, slope 1-3%, moderate erosion	75 (14.66)
992	Railway property		Lands under Railways	**2 (0.3)**
1000	Others		Habitaion and waterbody	**34 (6.65)**

*Soil map unit numbers are continuous for the taluk, not the microwatershedss

3.6 Land Use Classes

The 9 soil phases identified and mapped in the microwatersheds were regrouped into 4 Land Use Classes (LUC's) for the purpose of preparing a Proposed Crop Plan for sustained development of the microwatersheds. The database (soil phases) generated under LRI was utilized for identifying Land Use Classes (LUC's) based on the management needs. One or more than one soil site characteristic having influence on the management have been choosen for identification and delineation of LUCs. For Haligeri-2 & Haligeri-3 Microwatersheds, five soil and site characteristics, namely soil depth, soil texture, slope, erosion and gravel content have been considered for defining LUCs. The land use classes are expected to behave similarly for a given level of management.

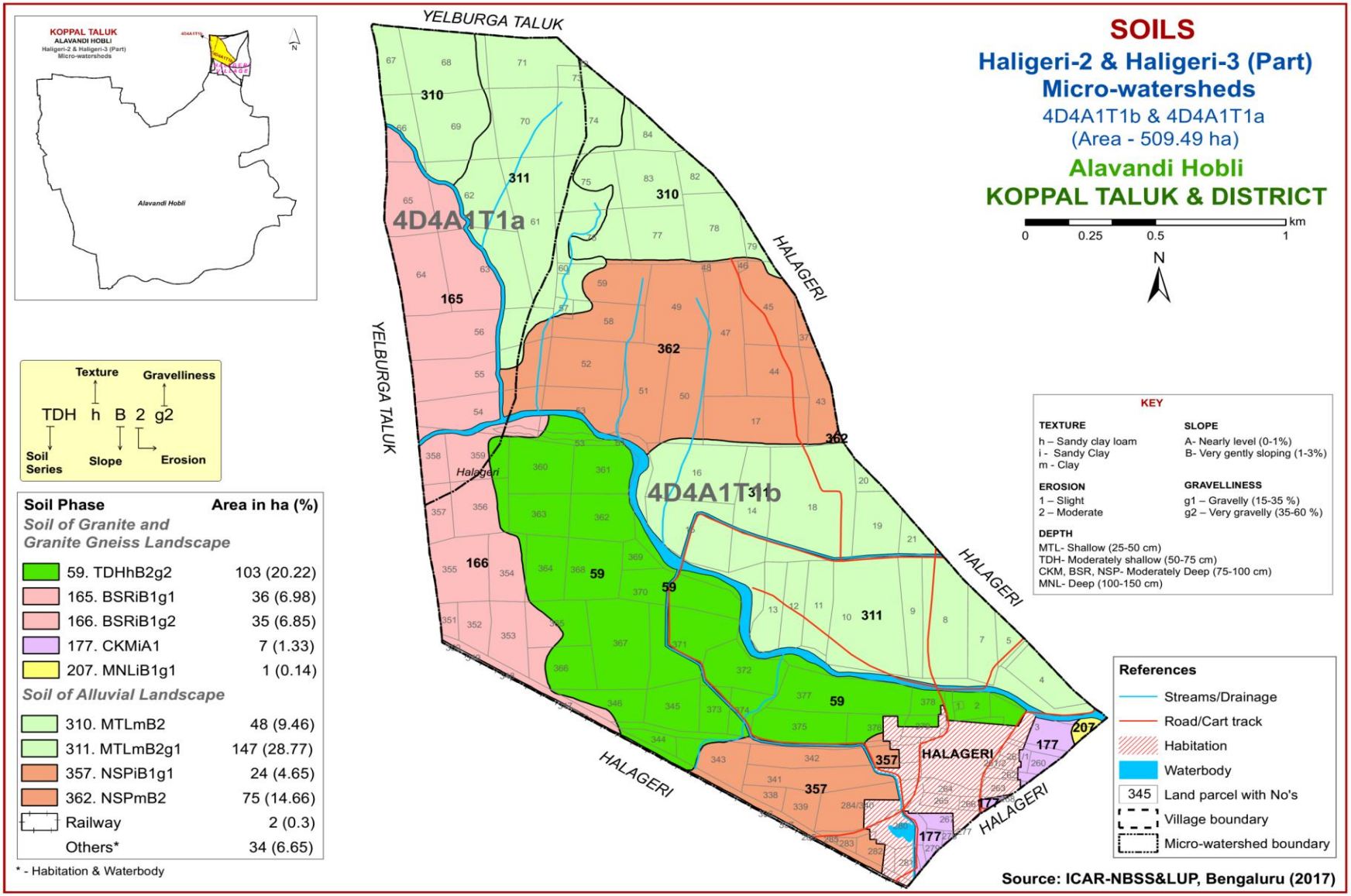

Fig 3.4 Soil Phase or Management Units-Haligeri-2 & Haligeri-3 Microwatersheds

Chapter 4

THE SOILS

Detailed information pertaining to the nature, extent and distribution of different kinds of soils occurring in Haligeri-2 & Haligeri-3Microwatersheds is provided in this chapter. The microwatersheds area has been identified as granite gneiss and alluvial landscapesbased on geology. In all,6 soil series are identified. Soil formation is the result of the combined effect of environmental and terrain factors that are reflected in soil morphology. The soil formation is dominantly influenced by the parent material, climate, time and relief.

A brief description of each of the 6 soil series identified followed by 9 soil phases (management units) mapped (Fig. 3.4) are furnished below. The physical and chemical characteristics of soil series identified in Haligeri-2 & Haligeri-3 microwatershedsare given in Table 4.1. The soils in any one map unit differ from place to place in their depth, texture, slope, gravelliness, erosion or any other site characteristic that affect management. The soil phase map can be used for identifying the suitability of areas for growing specific crops or for other alternative uses and also for deciding the type of conservation structures needed. The detailed information on soil and site-characteristics like soil depth, surface soil texture, slope, erosion, gravelliness, AWC, LCC etc, with respect to each of the soil phase identified is given village/survey number wise for the microwatersheds in Appendix-I.

4.1 Soils of Granite and granite gneiss landscape

In this landscape, 4 soil series are identified and mapped. Of these, Thammadahalli (TDH) 103 ha (20%), followed byBisarahalli (BSR) 71 ha (14%), Chikkamegheri (CKM) 7 ha (1%) and Mornal 1 ha (<1%) occupy minor area in the microwatersheds.The brief description of each soil series along with the soil phases identified and mapped is given below.

4.1.1Thammadahalli (TDH) Series: Thammadahalli soils are moderately shallow (50-75cm), well drained, have brown to very dark brown and dark reddish brownsandy clay to clay soils. They have developed from granite gneiss and occur on nearly level to gently sloping uplands.The Thammadahalli series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 54 to 75 cm. The thickness of A horizon ranges from 11 to 19 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2.5 to 4 and chroma 2 to 6. The texture varies from sandy clay loam to clay with 10 to 20 per cent gravel. The thickness of B horizon ranges from 43 to 60 cm. Its colour is in 2.5 YR hue with value 3 and chroma 4 to 6. Its texture is sandy clay to clay. The available water capacity is medium (100-150 mm/m).Only one phase was identified and mapped.

Landscape and soil profile characteristics of Thammadahalli (TDH) Series

4.1.2 Bisarahalli (BSR) Series: Bisarahalli soils are moderately deep (75-100 cm), well drained, have dark reddish brown gravelly sandy clay red soils. They have developed from weathered granite gneiss and occur on very gently sloping uplands under cultivation.

The thickness of the solum ranges from 75 to 98 cm. The thickness of A horizon ranges from 17 to 25 cm. Its colour is in 5 YR hue with value 3 to 4 and chroma 3 to 6. The texture ranges from sandy clay loam to sandy clay with 15 to 35 per cent gravel. The thickness of B horizon ranges from 61 to 79 cm. Its colour is in 5 YR hue with value 3 and chroma 3 to 4. Its texture is gravelly sandy clay with gravel content of 15-35 per cent. The available water capacity is low (50-100 mm/m). Two phases were identified and mapped.

Landscape and soil profile characteristics of Bisarahalli (BSR)Series.

4.1.3 Chikkamegheri (CKM) Series: Chikkamegheri soils are moderately deep (75-100 cm), well drained, have dark brown to dark reddish brown and red sandy clay soils. They have developed from granite gneiss and occur on nearly level to very gently sloping uplands.The Chikkamegheri series has been classified as a member of the fine, mixed, isohyperthermic family of Rhodic Paleustalfs.

The thickness of the solum ranges from 76 to 100 cm. The thickness of A horizon ranges from 11 to 24 cm. Its colour is in 7.5 YR, 5YR and 2.5 YR hue with value 2 to 4 and chroma 3 to 6. The texture varies from sandy clay loam to sandy clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 65 to 86 cm. Its colour is in 2.5 YR hue with value 2.5 to 3 and chroma 3 to 6. Its texture is dominantly sandy clay toclay. The available water capacity is medium (100-150 mm/m). Only one phase was identified and mapped.

Landscape and soil profile characteristics of Chikkamegheri (CKM) Series

4.1.4Mornal(MNL) Series: Mornal soils are deep (100-150 cm), well drained have dark reddish brown to dark red gravelly,sandy clay loam to sandy clay soils. They are developed from weathered granite gneiss and occur on very gently sloping uplandsunder cultivation.The Mornal series has been classified as a member of the fine, mixed, isohyperthermic family of Typic Rhodustalfs.

The thickness of the solum ranges from 112 to 149 cm. The thickness of A-horizon ranges from 15 to 25 cm. Its colour is in 5 YR, 10 YR hue with value 3 to 4 and chroma 2 to 4. The texture is sandy clay loam, sandy clay and clay with 15 to 30 per cent gravel. The thickness of B-horizon ranges from 103 to 131 cm. Its colour is in 2.5YR and 5 YR hue with value 2.5 to 4 and chroma 3 to 6. Texture is sandy clay loam to sandy clay with 15 to 35 per cent gravel. The available water capacity is medium (101-150 mm/m).Only one phase was identified and mapped.

Landscape and soil profile characteristics of Mornal (MNL)Series

4.2 Soils of Alluvial landscape

In this landscape, twosoil series has been identified and mapped. The brief description of soil series along with the soil phases identified and mapped is given below.

4.2.1Muttal (MTL) Series: Muttal soils are shallow (25-50 cm), well drained, have dark brown to very dark grayish brown, calcareousclay soils. They have developed from alluvium and occur on nearly level to very gently sloping uplands. The Muttal series has been classified as a member of clayey, mixed, isohyperthermic (calc) family of (Paralithic) Haplustepts.

The thickness of the solum ranges from 30 to 50 cm. The thickness of A horizon ranges from 15 to 18 cm. Its colour is in 7.5 YR and 10 YR hue with value 2 to 3 and chroma 2.5 to 4. The texture varies from sandy clay to clay with 10 to 15 per cent gravel. The thickness of B horizon ranges from 18 to 32 cm. Its colour is in 10 YR and 7.5 YR hue with value 2 to 6 and chroma 2 to 4. Its texture is sandy clay to clay. The available water capacity is low (50-100 mm/m). Two phases were identified and mapped.

Landscape and soil profile characteristics of Muttal (MTL) Series

4.2.2Narsapura (NSP) series: Narasapura soils are moderately deep (75-100 cm), moderately well drained, have dark grayish brown to very dark grayish brown and very dark gray, black, calcareous cracking clay soils They have developed from alluvium and occur on very gently sloping uplands. The Narsapura series has been classified as a member of the very fine, smectitic, isohyperthermic (calc) family of Typic Haplustepts.

The thickness of the solum is 76 to 98 cm. The thickness of A horizon ranges from 15 to 19 cm. Its colour is in 10 YR hue with value 3 and chroma 1 to 2.The texture is clay with no gravel. The thickness of B horizon ranges from 57 to 83 cm. Its colour is in 10 YR hue with value 3 to 5 and chroma 1 to 3. Its texture is clay. The available water capacity is medium (101-150 mm/m). Two phases were identified and mapped.

Landscape and soil profile characteristics of Narsapura (NSP) Series

Table: 4.1 Physical and Chemical Characteristics of Soil Series identified in Haligeri-2 & Haligeri-3 microwatersheds

Soil Series: Thammadahalli (TDH), Pedon-TR_1/1
Location: $15^0$03'41.7"N, $75^0$36'65.2"E, (4D4A3G2d), Nilogal village, Shirahatti taluk, Gadag district
Analysis at: NBSS&LUP, Regional Centre, Bengaluru **Classification:** Fine, mixed, isohyperthermic Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-25	Ap	85.71	7.34	6.94	14.79	13.28	16.10	24.75	16.80	20	ls	-	-
25-65	Bt	47.76	7.96	44.28	15.30	9.78	6.24	7.91	8.53	10	sc	-	-

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC /Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-25	9.19	-	-	0.18	0.35	1.29	-	-	0.08	0.52	0.60	3.57	0.51	100.00	14.57
25-65	8.00	-	-	0.17	0.35	0.58	-	-	0.15	1.31	1.46	13.87	0.31	100.00	9.44

Contd…

Series Name: Chikkamegheri (CKM), Pedon: RM-2
Location:$15^0$21'40"N, $76^0$16'43"E, Gudanahalli village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. Classification: Fine, mixed, isohyperthermic, Rhodic Paleustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-10	Ap	66.80	5.51	27.69	10.14	10.04	20.29	14.75	11.58	-	scl	20.59	7.15
10-25	Bt1	39.52	7.17	53.32	8.75	9.59	7.27	8.43	5.48	-	c	26.96	13.99
25-38	Bt2	42.00	7.16	50.84	13.16	8.74	6.42	8.53	5.16	-	c	26.51	13.42
38-55	Bt3	41.77	10.31	47.92	15.19	8.54	6.33	7.38	4.32	10	c	25.28	14.10
55-70	Bt4	44.03	8.96	47.01	15.72	9.22	6.92	6.81	5.35	20	c	24.30	14.35
70-90	Bt5	56.02	8.46	35.52	11.41	17.07	12.36	10.26	4.92	25	sc	20.59	13.06

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC /Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-10	7.99	-	-	0.326	0.83	4.44	9.35	4.76	0.28	0.54	14.93	12.50	0.45	119	4.33
10-25	7.36	-	-	0.345	0.99	2.40	10.37	4.84	0.10	1.18	16.48	17.60	0.33	94	6.68
25-38	6.69	-	-	0.477	0.79	0.00	10.25	4.20	0.09	1.61	16.15	16.10	0.32	100	10.01
38-55	6.45	-	-	0.548	0.63	0.00	9.43	2.86	0.10	1.52	13.91	14.80	0.31	94	10.27
55-70	6.35	-	-	0.532	0.71	0.00	9.59	2.79	0.11	1.66	14.16	14.60	0.31	97	11.39
70-90	6.44	-	-	0.613	0.27	0.00	9.58	3.10	0.19	1.87	14.74	14.70	0.41	100	12.69

Contd…

Series Name: Mornal (MNL), Pedon: R-12
Location: $15^0$22'75"N, $76^0$05'16.1" Halageri village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Fine mixed, isohyperthermic Typic Rhodustalfs

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-17	Ap	81.48	5.14	13.39	14.07	12.15	17.00	27.53	10.73	70	sl	9.64	4.93
17-31	Bt1	51.43	10.24	38.33	6.67	7.72	9.52	19.26	8.25	30	sc	23.97	11.70
31-56	Bt2	45.62	8.77	45.62	17.85	7.31	8.14	8.87	3.44	30	sc	25.94	12.45
56-104	Bt3	53.10	10.62	36.28	21.87	10.30	8.10	7.99	4.84	<30	sc	20.95	10.16
104-126	Bc	54.21	12.88	32.91	12.28	8.84	15.92	10.20	6.97	<30	scl	19.96	10.21

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC /Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-17	7.89	-	-	0.137	0.33	0.00	4.92	3.35	0.35	0.45	9.07	9.01	0.67	101	5.04
17-31	8.19	-	-	0.31	0.45	0.00	7.24	5.16	0.16	0.15	12.70	13.57	0.35	94	1.12
31-56	8.2	-	-	0.414	0.53	0.00	6.49	5.32	0.11	0.13	12.05	18.55	0.41	65	0.71
56-104	8.64	-	-	0.422	0.37	0.00	6.21	4.64	0.16	0.14	11.15	15.16	0.42	74	0.95
104-126	8.71	-	-	0.436	0.2	0.00	7.06	6.31	0.09	0.33	13.79	14.52	0.44	95	2.31

Contd…

Series Name: Muttal (MTL), Pedon: RM-13
Location: $15^0$14'30.8"N, $75^0$56'50.6"E, Gatareddihalla village, Koppal taluk and district
Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Clayey, mixed, isohyperthermic (calc) (Paralithic) Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-20	Ap	39.05	13.74	47.21	3.05	5.05	8.21	14.63	8.11	15-30	c	29.95	17.94
20-34	Bwk	28.77	19.57	51.66	4.81	4.71	4.92	9.09	5.24	10	c	33.44	21.56

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC /Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-20	8.27	-	-	0.202	0.79	6.10	-	-	0.62	0.25	-	36.64	0.78	-	0.69
20-34	8.36	-	-	0.177	0.99	23.04	-	-	0.29	0.38	-	39.60	0.77	-	0.96

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Series Name: Narsapura (NSP), Pedon: A2/RM-2

Location: $15^0$19'86.9"N, $75^0$57'86.1"E, Kavalura village, Koppal taluk and district

Analysis at: NBSS&LUP, Regional Centre, Bangalore. **Classification:** Very fine, smectitic, isohyperthermic (calc) Typic Haplustepts

Depth (cm)	Horizon	Size class and particle diameter (mm)								Coarse fragments w/w (%)	Texture Class (USDA)	% Moisture	
		Total			Sand								
		Sand (2.0-0.05)	Silt (0.05-0.002)	Clay (<0.002)	Very coarse (2.0-1.0)	Coarse (1.0-0.5)	Medium (0.5-0.25)	Fine (0.25-0.1)	Very fine (0.1-0.05)			1/3 Bar	15 Bar
0-29	Ap	31.32	16.52	52.16	5.51	5.40	5.51	9.83	5.08	10	c	38.86	27.64
29-52	Bw1	13.30	22.08	64.62	2.52	2.41	2.41	3.67	2.29	05	c	49.88	40.05
52-77	BW2	13.22	17.39	69.40	3.56	2.41	1.95	2.76	2.53	05	c	51.33	41.55

Depth (cm)	pH (1:2.5)			E.C. (1:2.5)	O.C.	$CaCO_3$	Exchangeable bases					CEC	CEC/ Clay	Base saturation	ESP
							Ca	Mg	K	Na	Total				
	Water	$CaCl_2$	M KCl	dS m^{-1}	%	%	cmol kg^{-1}							%	%
0-29	9.16	-	-	0.615	0.23	9.36	-	-	0.72	10.98	-	51.09	0.98	-	21.49
29-52	8.69	-	-	2.01	0.5	8.64	-	-	0.55	24.42	-	60.63	0.94	-	40.27
52-77	8.52	-	-	2.68	0.46	7.68	-	-	0.50	25.65	-	60.74	0.88	-	42.24

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Chapter 5

INTERPRETATION FOR LAND RESOURCE MANAGEMENT

The most important soil and site characteristics that affect the land use and conservation needs of an area are land capability, land irrigability, soil depth, soil texture, coarse fragments, available water capacity, soil slope, soil erosion, soil reaction etc. These are interpreted from the data base generated through land resource inventory and several thematic maps are generated. These would help in identifying the areas suitable for growing crops and, soil and water conservation measures and structures needed thus helping to maintain good soil health for sustained crop production. The various thematic maps generated are described below.

5.1 Land Capability Classification

Land capability classification is an interpretative grouping of soil map units (soil phases) mainly based on inherent soil characteristics, external land features and environmental factors that limit the use of land for agriculture, pasture, forestry or other uses on a sustained basis (IARI, 1971). The land and soil characteristics used to group the land resources in an area into various land capability classes, subclasses and units are

Soil characteristics: Soil depth, soil texture, coarse fragments, soil reaction, available water capacity, calcareousness, salinity/alkali *etc.*

Land characteristics: Slope, erosion, drainage, rock outcrops.

Climate: Total rainfall and its distribution, and length of crop growing period.

The land capability classification system is divided into land capability classes, subclasses and units based on the level of information available. Eight land capability classes are recognized. They are

Class I: They are very good lands that have no limitations or very few limitations that restrict their use.

Class II: They are good lands that have minor limitations and require moderate conservation practices.

Class III: They are moderately good lands that have severe limitations that reduce the choice of crops or that require special conservation practices.

Class IV: They are fairly good lands that have very severe limitations that reduce the choice of crops or that require very careful management.

Class V: Soils in these lands are not likely to erode, but have other limitations like wetness that are impractical to remove and as such not suitable for agriculture, but suitable for pasture or forestry with minor limitations.

Class VI: The lands have severe limitations that make them generally unsuitable for cultivation, but suitable for pasture or forestry with moderate limitations.

Class VII: The lands have very severe limitations that make them unsuitable for cultivation, but suitable for pasture or forestry with major limitations.

Class VIII: Soil and other miscellaneous areas (rock lands) that have very severe limitations that nearly preclude their use for any crop production, but suitable for wildlife, recreation and installation of wind mills.

The land capability subclasses are recognised based on the dominant limitations observed within a given land capability class. The subclasses are designated by adding a lower case letter like 'e', 'w', 's', or 'c' to the class numeral. The subclass "e" indicates that the main hazard is risk of erosion, "w" indicates drainage or wetness as a limitation for plant growth, "s" indicates shallow soil depth, coarse or heavy textures, calcareousness, salinity/alkalinity or gravelliness and "c" indicates limitation due to climate.

The land capability subclasses have been further subdivided into land capability units based on the kinds of limitations present in each subclass. Ten land capability units are used in grouping the soil map units. They are stony or rocky (0), erosion hazard (slope, erosion) (1), coarse texture (sand, loamy sand, sandy loam) (2), fine texture (cracking clay, silty clay) (3), slowly permeable subsoil (4), coarse underlying material (5), salinity/alkali (6), stagnation, overflow, high ground water table (7), soil depth (8) and fertility problems (9). The capability units thus identified have similar soil and land characteristics that respond similarly to a given level of management. The soils of the microwatersheds have been classified upto land capability subclass level.

The 9 soil map units identified in the Haligeri-2 & Haligeri-3 microwatersheds are grouped under twoland capability classes and three land capability subclasses(Fig. 5.1).

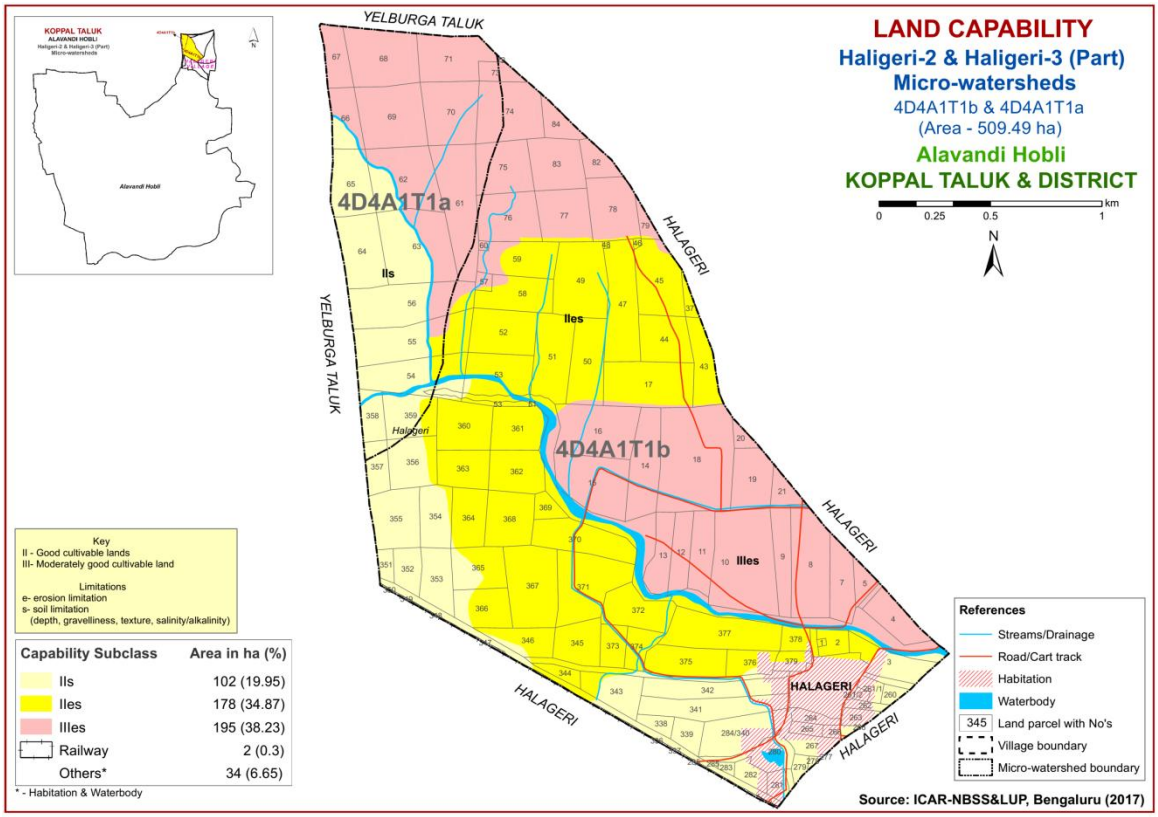


Fig. 5.1 Land Capability map of Haligeri-2 & Haligeri-3Microwatersheds

Entire are of the microwatersheds is suitable for agriculture. An area of 280 ha (55%) is good cultivable lands (Class II) that have minor limitations and require moderate conservation practices and are distributed in the major part of the microwatersheds. Moderately good cultivable lands (Class III) cover an area of 195 ha (38%) and are distributed in the northern and eastern part of the microwatersheds with moderate problems of erosion and soil.

5.2 Soil Depth

Soil depth refers to the depth of the soil occurring above the parent material or hard rock. The depth of the soil determines the effective rooting depth for plants and in accordance with soil texture, mineralogy and gravel content, the capacity of the soil column to hold water and nutrient availability. Soil depth is one of the most important soil characteristic that is used in differentiating soils into different soil series. The soil depth classes used in identifying soils in the field are very shallow (<25 cm), shallow (25-50 cm), moderately shallow (50-75 cm), moderately deep (75-100 cm), deep (100-150 cm) and very deep (>150 cm). They were used to classify the soils into different depth classes and a soil depth map was generated (Fig. 5.2).

Shallow (25-50 cm) cover an area of 195 ha (38%) and are distributed in the northern and eastern part of the microwatersheds.Moderately shallow (25-75 cm) soils occupy an area of103 ha (20%) and are distributed in the central and southern part of the microwatersheds. Moderately deep soils (75-100 cm) occupy an area of 176 ha (34%) and occur in the northern, southern and westernpart of the microwatersheds. Deep (100-150 cm)soils occupy an area of 1 ha (<1%) and are distributed in the eastern part of the microwatersheds.

The most problem lands with an area of about 195 ha (38%) having shallow (25-50 cm) rooting depth are suitable for growing short duration agricultural crops but well suited for pasture, forestry or other recreational purposes. The productive lands cover about 1ha where all climatically adopted long duration crops be grown.

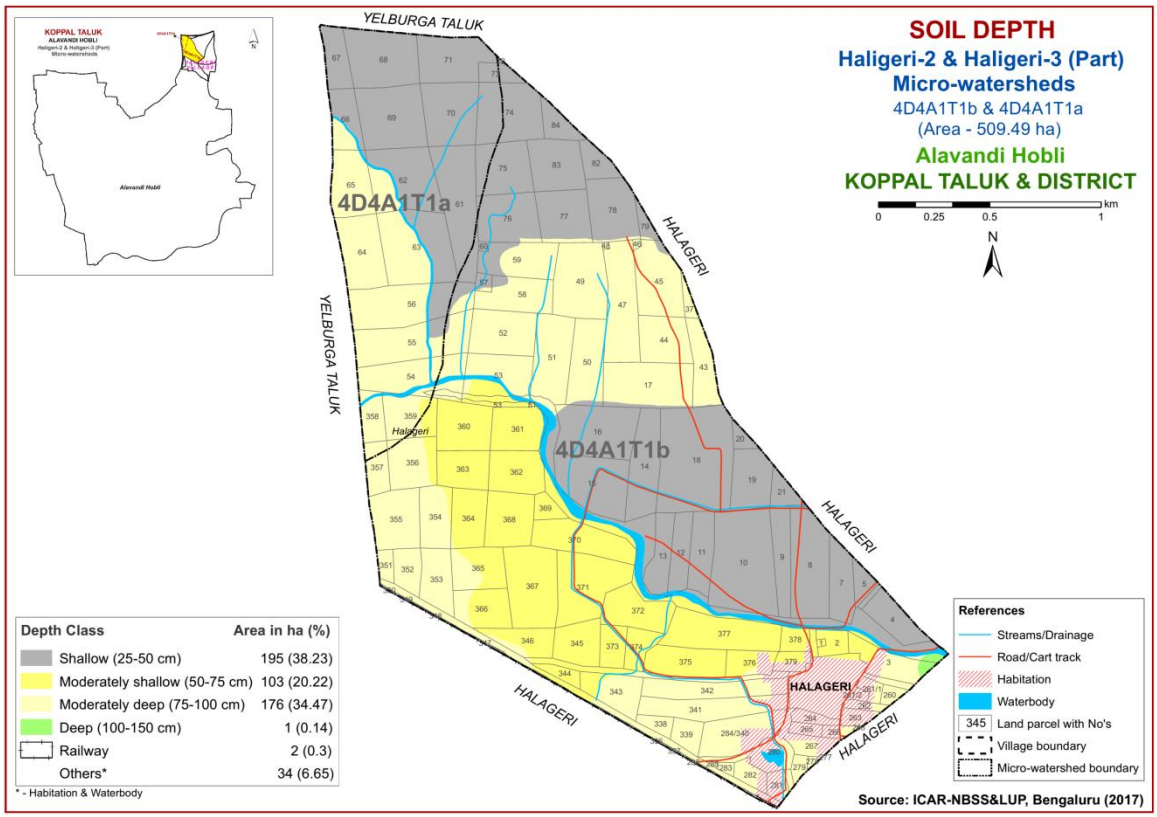


Fig. 5.2Soil Depth map of Haligeri-2 & Haligeri-3Microwatersheds

5.3 Surface Soil Texture

Texture is an expression to indicate the coarseness or fineness of the soil as determined by the relative proportion of primary particles of sand, silt and clay. It has a direct bearing on the structure, porosity, adhesion and consistence. The surface layer of a soil to a depth of about 25 cm is the layer that is most used by crops and plants. The surface soil textural class provides a guide to understanding soil-water retention and availability, nutrient holding capacity, infiltration, workability, drainage, physical and chemical behaviour, microbial activity and crop suitability.

An area of 103 ha (20%) has loamy soils at the surface and are distributed in the central and southern part of the microwatersheds. An area of about 371 ha (72%) has clayeysoils at the surface and are distributed in the major part of themicrowatersheds (Fig. 5.3).

The most productive lands 371 ha (72%) with respect to surface soil texture are clayey soils that have high potential for soil-water retention and availability, and nutrient retention and availability, but have more problems of drainage, infiltration, workability and other physical problems. The other most productive lands 103 ha (20%) are loamy soils which also have high potential for AWC, nutrient availability but have no drainage or other physical problems.

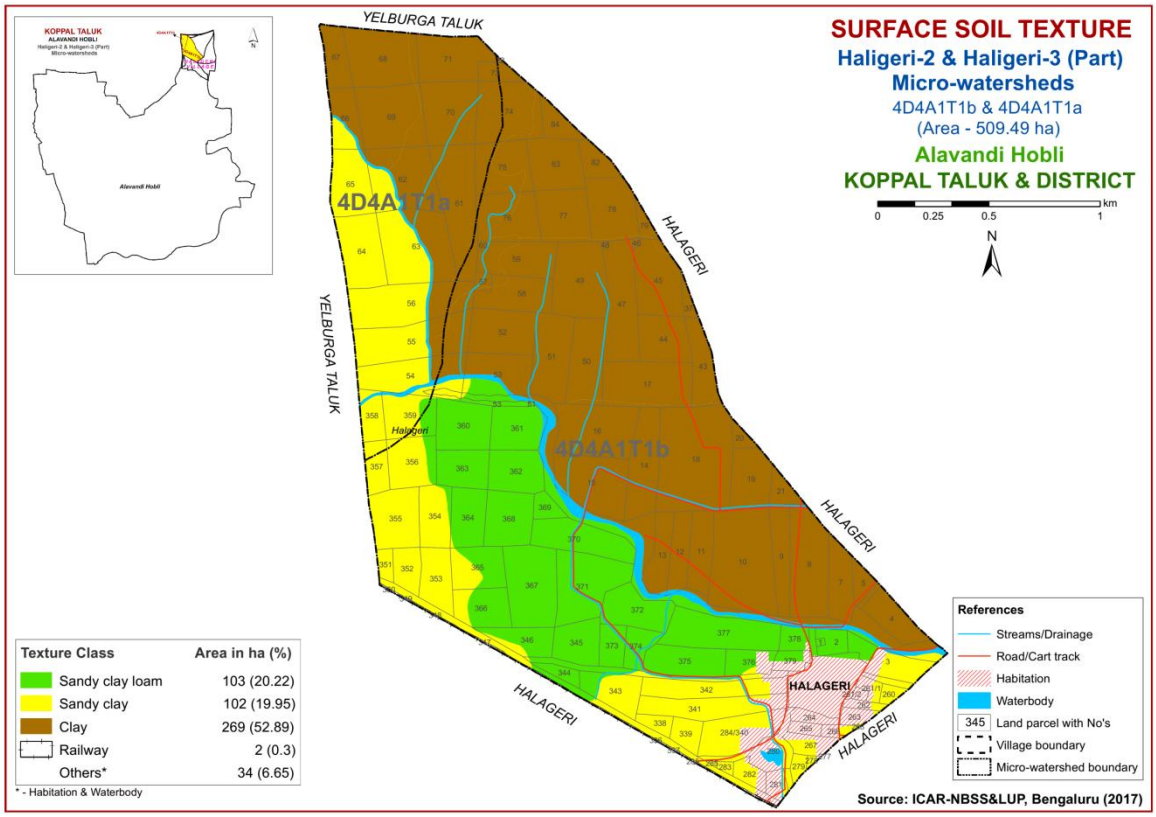


Fig. 5.3 Surface Soil Texture map of Haligeri-2 & Haligeri-3Microwatersheds

5.4 Soil Gravelliness

Gravel is the term used for describing coarse fragments between 2 mm and 7.5 cm diameter and stones for those between 7.5 cm and 25 cm. The presence of gravel and stones in soil reduces the volume of soil responsible for moisture and nutrient storage, drainage, infiltration and runoff, and hinders plant growth by impeding root growth and seedling emergence, intercultural operations and farm mechanization.

The soils that are non-gravelly (<15% gravel) cover an area of about 130 ha (25%) and are distributed in the northern, southeastern and northwestern part of the microwatersheds. An area of 207 ha (41%) is covered by gravelly (15-35% gravel) soils and are distributed in the major part of the microwatersheds. About 138 ha (27%) has soils that are very gravelly (35-60% gravel) and are distributed in the central, southern and southwestern part of the microwatersheds (Fig. 5.4).

The most productive lands with respect to gravelliness are found to be 25%. They are non-gravelly with less than 15 per cent gravel and have potential for growing both annual and perennial crops. The problem soils that are gravelly (15-35%)and very gravelly (35-60%) cover 345 ha (68%) where only short duration crops can be grown.

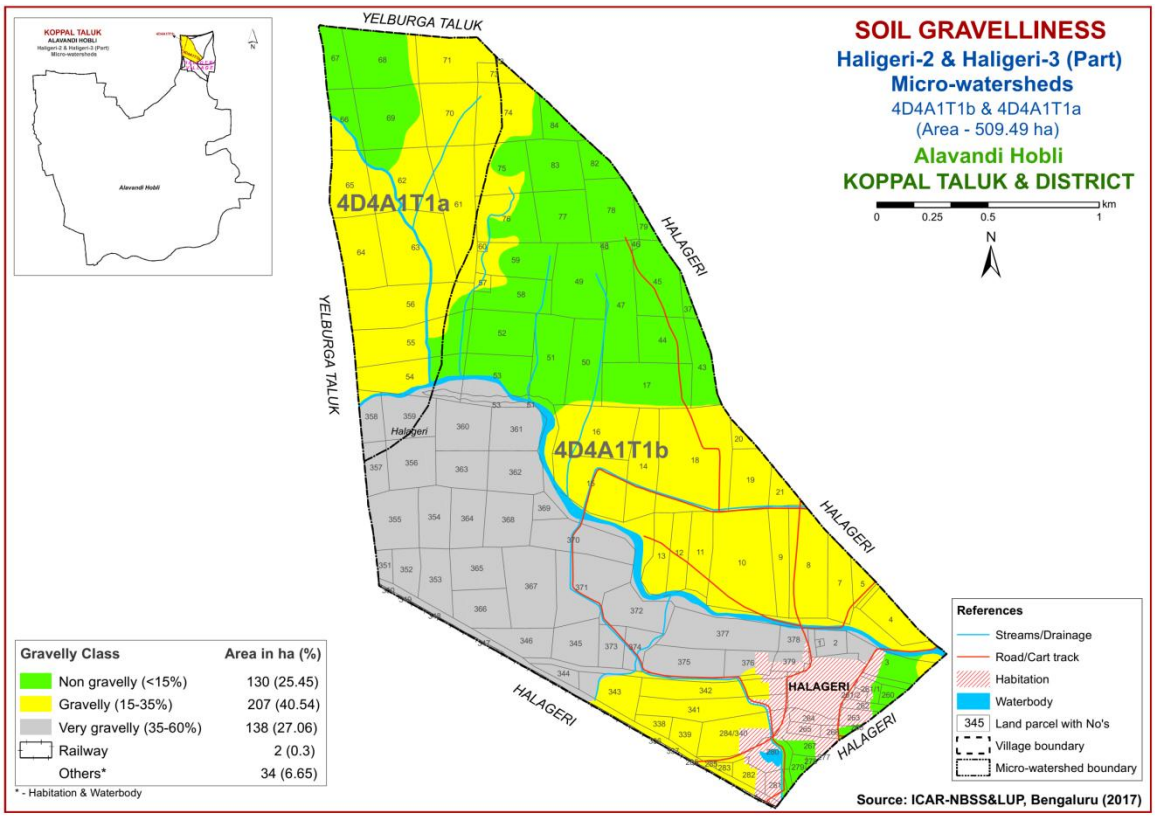


Fig. 5.4 Soil Gravelliness map of Haligeri-2 & Haligeri-3 Microwatersheds

5.5 Available Water Capacity

The soil available water capacity (AWC) is estimated based on the ability of the soil column to retain water between the tensions of 0.33 and 15 bar in a depth of 100 cm or the entire solum if the soil is shallower. The AWC of the soils (soil series) as estimated by considering the soil texture, mineralogy, soil depth and gravel content (Sehgal *et al.*, 1990) and accordingly the soil map units were grouped into five AWC classes *viz*, very low (<50 mm/m), low (50-100 mm/m), medium (100-150 mm/m), high (150-200 mm/m) and very high (>200 mm/m) and using these values, an AWC map was generated (Fig. 5.5).

Major area of about 368 ha (72%) are low (51-100 mm/m) in available water capacity and are distributed in the major part of the microwatersheds.An area of about 106 ha (21%) is medium (101-150 mm/m) in available water capacity and are distributed in the southern and northeastern part of the microwatersheds.

An area of about 368 ha (72%) in the microwatersheds has soils that are problematic with regard to available water capacity. Here, only short duration crops can be grown and the probability of crop failure is very high. These areas are best put to other alternative uses.

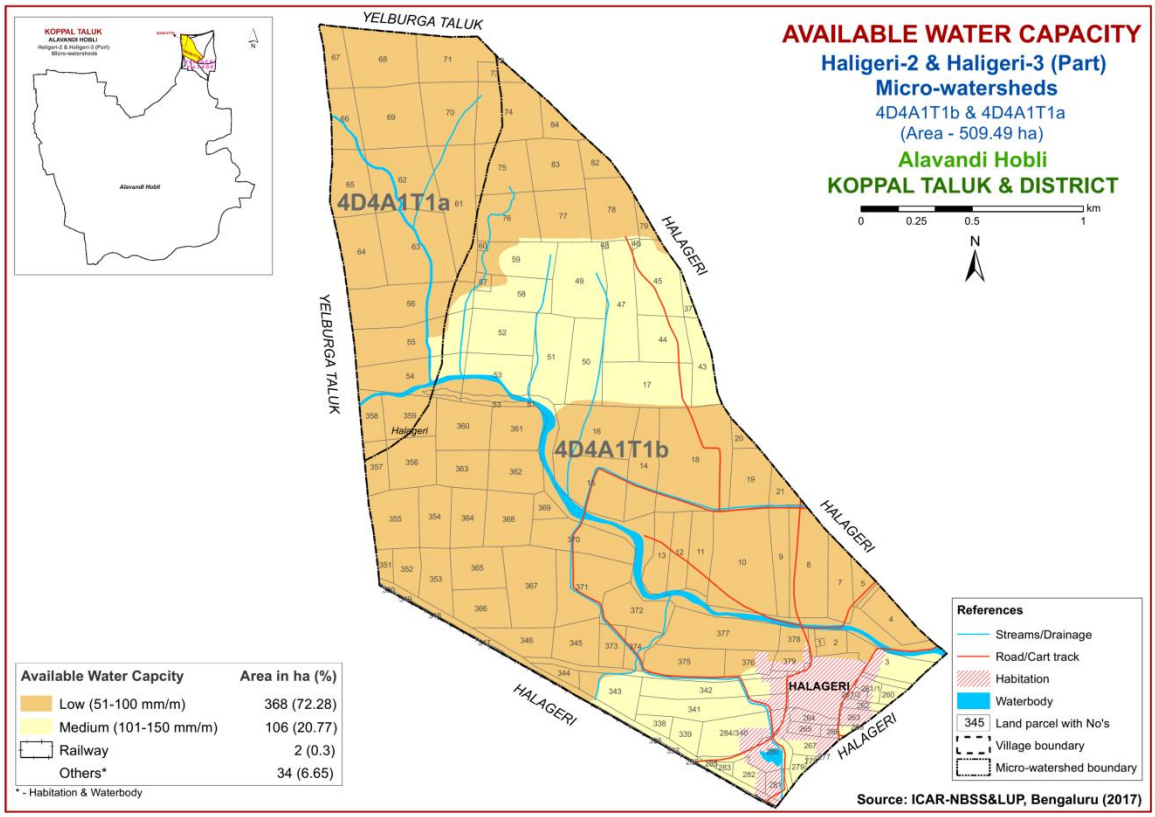


Fig. 5.5 Soil Available Water Capacity map of Haligeri-2 & Haligeri-3 Microwatersheds

5.6 Soil Slope

Soil slope refers to the inclination of the surface of the land. It is defined by gradient, shape and length, and is an integral feature of any soil as a natural body. Slope is considered important in soil genesis, land use and land development. The length and gradient of slope influences the rate of runoff, infiltration, erosion and deposition. The soil map units were grouped into four slope classes and a slope map was generated showing the area extent and their geographic distribution of different slope classes in the microwatersheds (Fig. 5.6).

Nearly level (0-1%) soils occupy an area of 7 ha (1%) and are distributed in the southern part of the microwatersheds. Major area of about 467 ha (92%) falls under very gently sloping (1-3% slope)lands and are distributed in all parts of the microwatersheds. In all these lands, all climatically adapted annual and perennial crops can be grown with appropriate soil and water conservation and other land development measures.

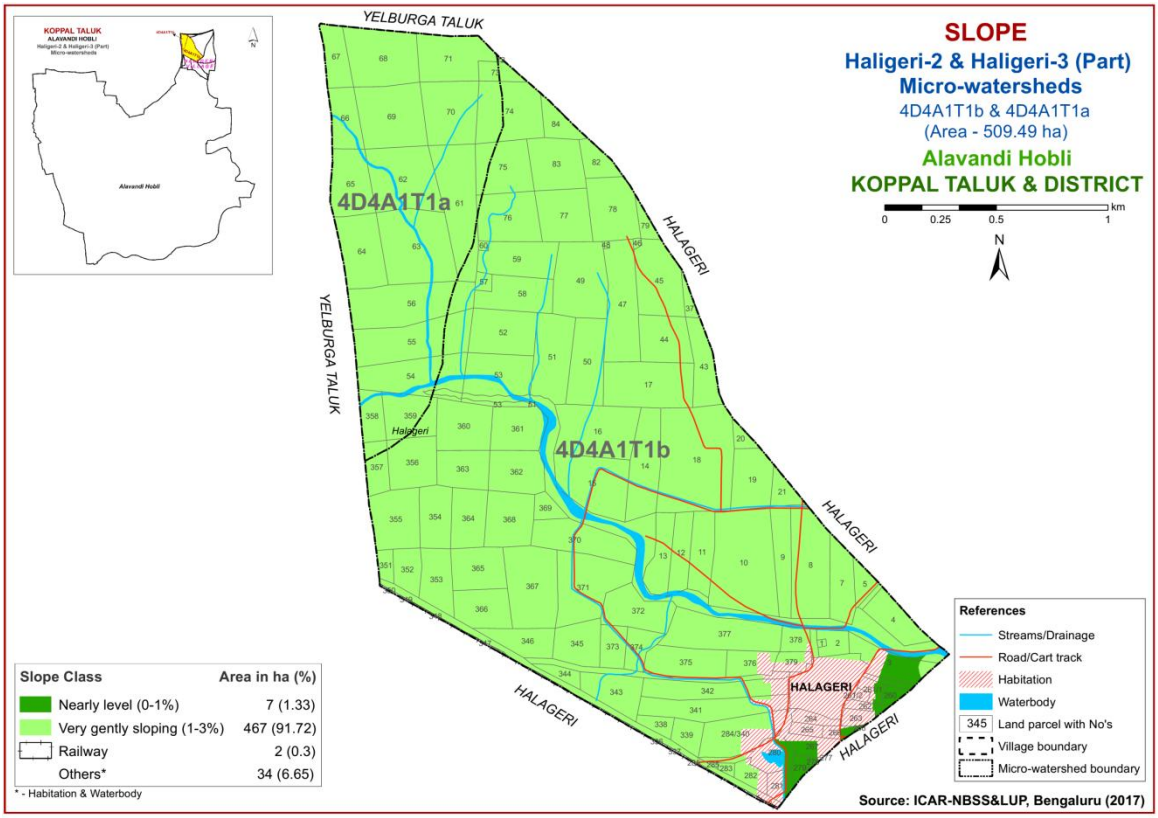


Fig. 5.6 Soil Slope map of Haligeri-2 & Haligeri-3 Microwatersheds

5.7 Soil Erosion

Soil erosion refers to the wearing away of the earth's surface by the forces of water, wind and ice involving detachment and transport of soil by raindrop impact. It is used for accelerated soil erosion resulting from disturbance of the natural landscape by burning, excessive grazing and indiscriminate felling of forest trees and tillage, all usually by man. The erosion classes showing an estimate of the current erosion status as judged from field observations in the form of rills, gullies or a carpet of gravel on the surface are recorded. Four erosion classes, viz, slight erosion (e1), moderate erosion (e2), severe erosion (e3) and very severe erosion (e4) are recognized. The soil map units were grouped into different erosion classes and a soil erosion map generated. The area extent and their spatial distribution in the microwatershedsis given in Figure 5.7.

Soils that are slightly eroded (e1 class) occupy an area of about 102 ha (20%) and are distributed in the western and southern part of the microwatersheds. Moderately eroded (e2 class) soils cover an area of 372 ha (73%) and are distributed in the major part of the microwatersheds.

An area of about 372 ha (73%) in the microwatersheds is problematic because of moderate erosion. These areas need soil and water conservation and other land development measures for restoring the soil health.

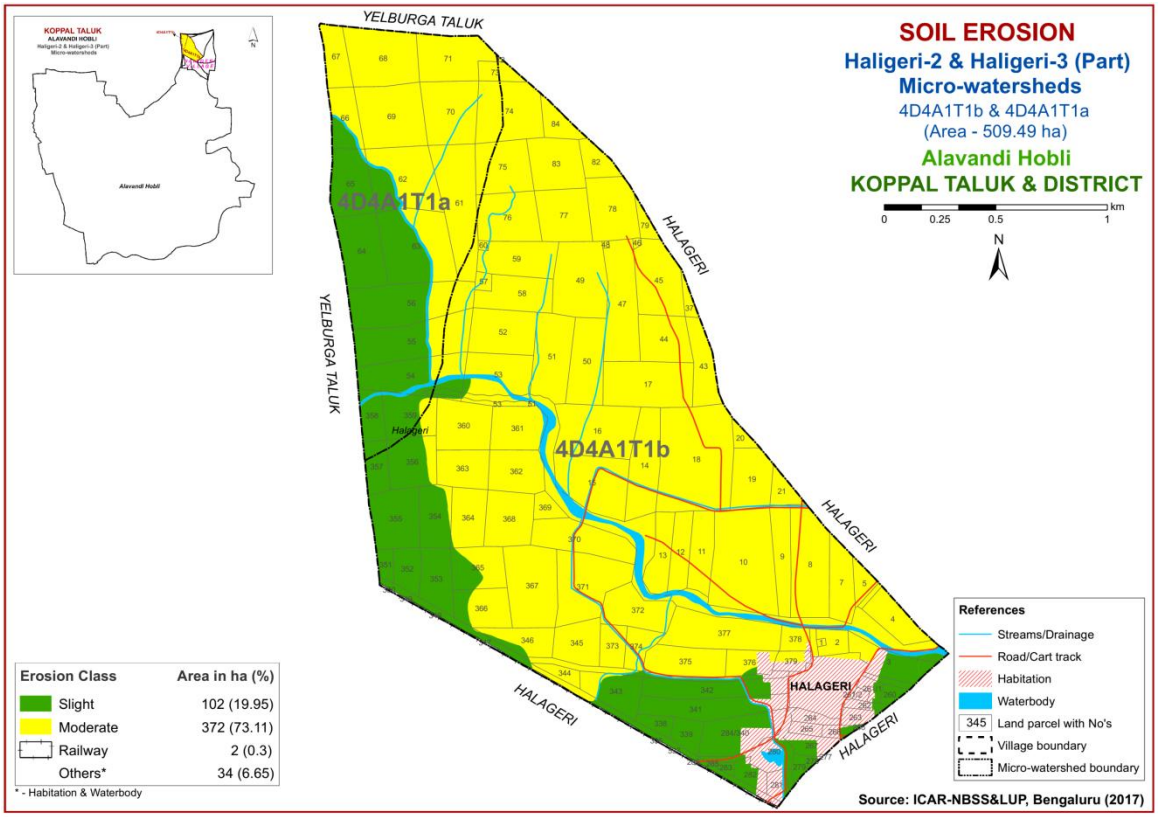


Fig. 5.7 Soil Erosion map of Haligeri-2 & Haligeri-3 Microwatersheds

Chapter 6

FERTILITY STATUS

Soil fertility plays an important role in increasing crop yield. The adoption of high yielding varieties that require high amounts of nutrients has resulted in deficiency symptoms in crops and plants due to imbalanced fertilization and poor inherent fertility status, as these areasare characterised by low rainfall and high temperatures. Hence, it is necessary to know the fertility (macro and micro nutrients) status of the soils of the watersheds for assessing the kind and amount of fertilizers required for each of the crop intended to be grown. For this purpose, the surface soil samples collected from the grid points (one soil sample at every 250 m grid interval) all over the microwatersheds through land resource inventory in the year 2017 were analysed for pH, EC, organic carbon, available phosphorus and potassium and for micronutrients like zinc, boron, copper, iron and manganese, and secondary nutrient sulphur.

Soil fertility data generated has been assessed and individual maps for all the nutrients for the microwatersheds have been generated by using the Kriging method under GIS. The village/survey number wise fertility data for the microwatersheds is given in Appendix-II.

6.1 Soil Reaction (pH)

The soil analysis of the Haligeri-2 & Haligeri-3 microwatershedsfor soil reaction (pH) showed that an area of 3ha (1%) is neutral (pH 6.5-7.3) and are distributed in the southern part of the microwatersheds. Slightly to moderately alkaline (pH 7.3-8.4) soils occupy 208 ha (41%) and are distributed in the western, southern and central part of the microwatersheds. An area of 172 ha (34%) is strongly alkaline (pH 8.4-9.0) and are distributed in the northwestern, central and eastern part of the microwatersheds. Very strongly alkaline soils occurin an area of 90 ha (18%) and are distributed in the northeastern part of the microwatersheds(Fig. 6.1). Thus, all the soils in the microwatersheds are alkaline in reaction except for a small area of 3 ha which is neutral in reaction..

6.2 Electrical Conductivity (EC)

The Electrical Conductivity of the soils is <2 dS m^{-1}in the entire microwatersheds and as such the soils are non-saline (Fig. 6.2).

6.3 Organic Carbon

The soil organic carbon content (an index of available Nitrogen)in the soils of the microwatersheds is low (<0.5%) coveringanarea of 79 ha (16%) and is distributed in the northeastern part of the microwatersheds.An area of 395 ha (77%) is medium(0.5-0.75%) in organic carbon contentand is distributed in the majorpart of the microwatersheds(Fig.6.3).

6.4 Available Phosphorus

An area of about 129 ha (25%) is low (<23 kg/ha) in available phosphorus and is distributed in the northern and northeastern part of the microwatersheds.Major area of about 345 ha (68%) is medium (23-57 kg/ha) and is distributed in all parts of the microwatersheds(Fig.6.4).

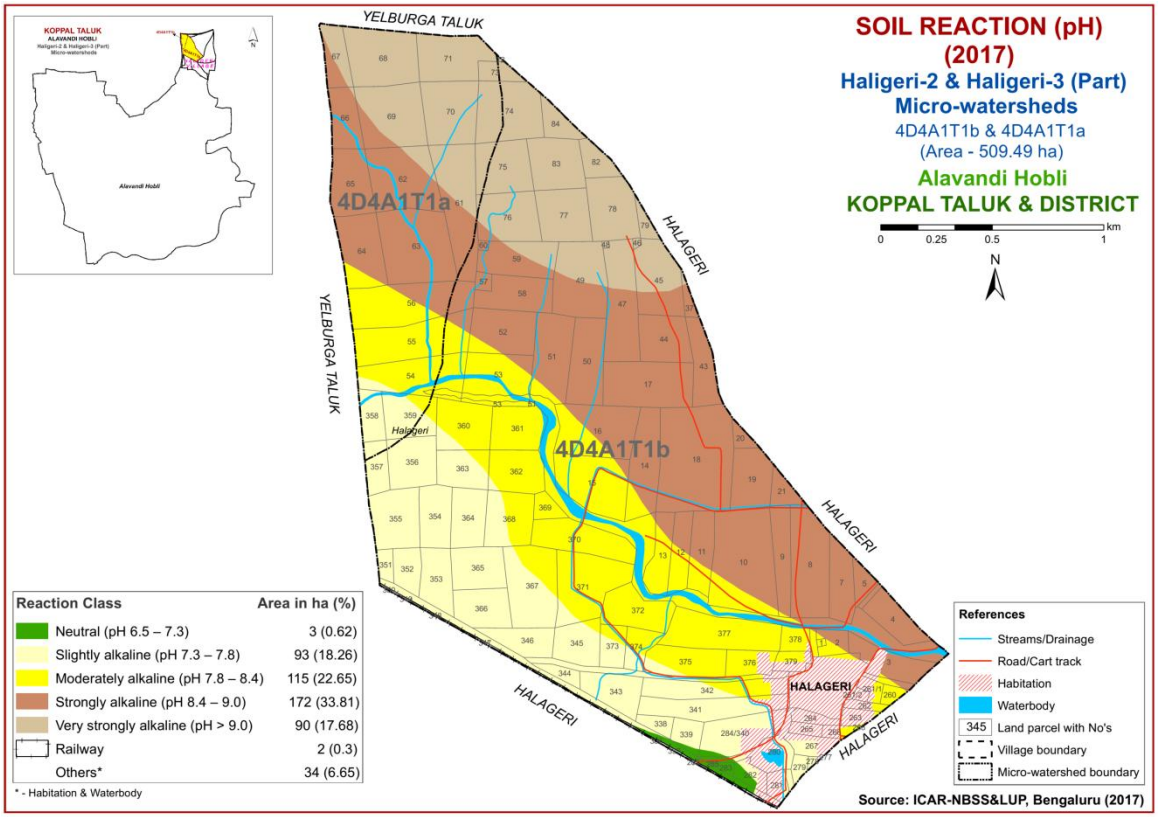


Fig.6.1 Soil Reaction (pH) map of Haligeri-2 & Haligeri-3 Microwatersheds

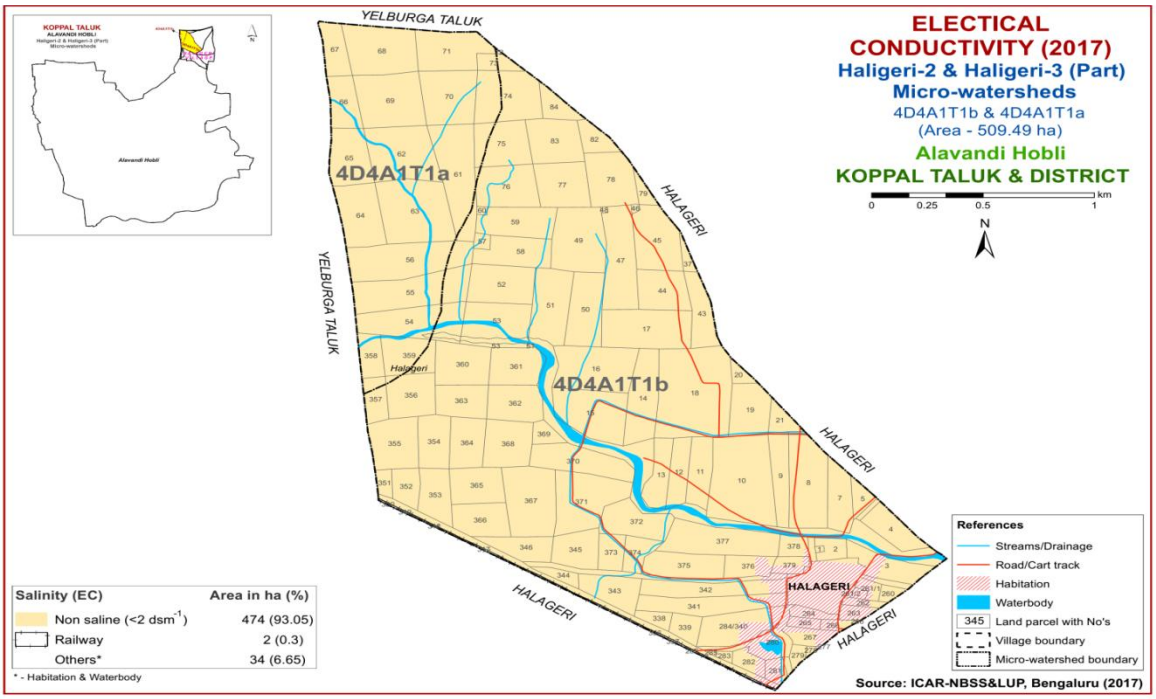


Fig.6.2Electrical Conductivity (EC) map of Haligeri-2 & Haligeri-3 Microwatersheds

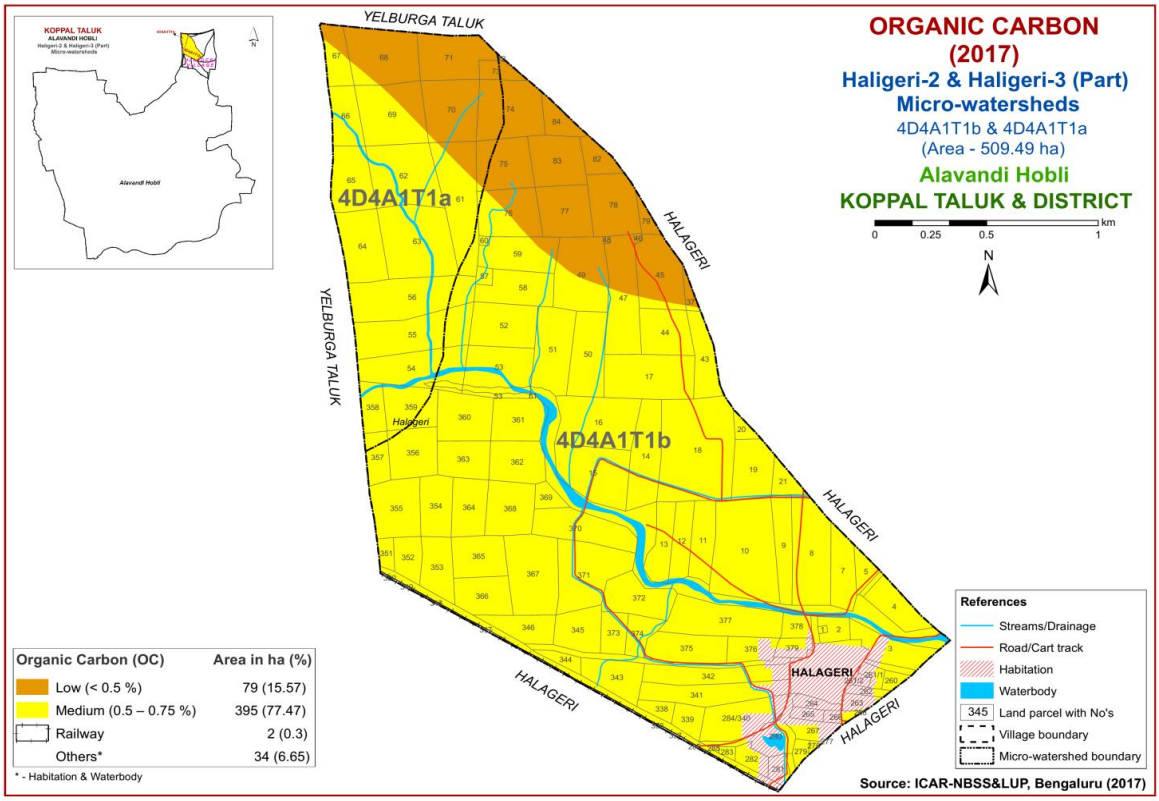


Fig.6.3Soil Organic Carbon map of Haligeri-2 & Haligeri-3 Microwatersheds

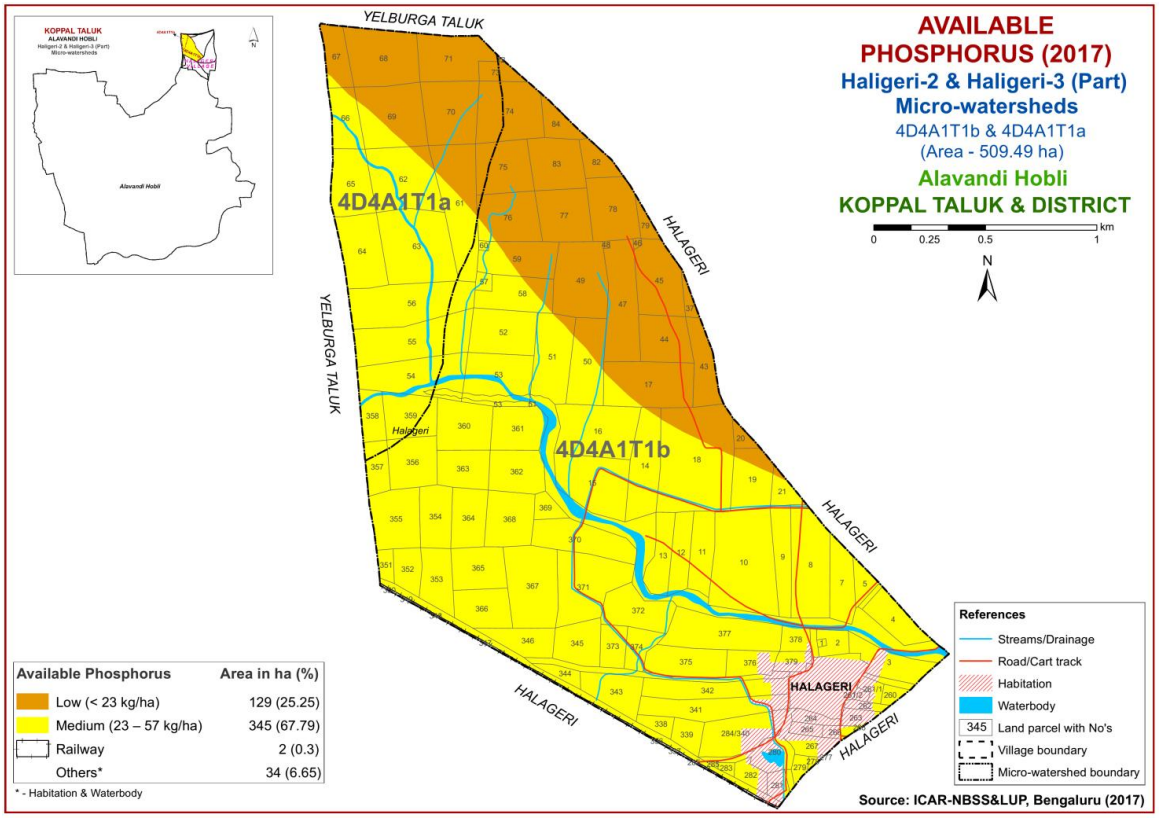


Fig.6.4 Soil Available Phosphorus map of Haligeri-2 & Haligeri-3Microwatersheds

6.5 Available Potassium

An area of 107 ha (21%) is medium (145-337 kg/ha) in available potassium content and are distributed in the southwesternpart of the microwatersheds. Major area of about 367 ha (72%) is high (145-337 kg/ha) and are distributed in all parts of the microwatersheds(Fig. 6.5).

6.6 Available Sulphur

Soils that are low available sulphur content (<10 ppm) cover an area of 196 ha (38%) and are distributed in the southern, northeastern and northern part of the microwatersheds. An area of 95ha (38%) is medium (10-20 ppm) in available sulphur content and are distributed in the central, northeastern and western partofthe microwatersheds.An area of about 183 ha (36%) is high (>20 ppm) in available sulphurcontent and are distributed in the southern, western and eastern part of the microwatersheds(Fig.6.6). The areas that are low and medium in available sulphur need to be applied with magnesium sulphate or gypsum or factomphos (p) fertilizer (13% sulphur) for 2-3 years for the deficiency to be corrected.

6.7 Available Boron

Available boron content is medium (0.5-1.0 ppm) in an area of 229 ha (45%) and are distributed in the southern, eastern, western and central part of the microwatersheds. High (>1.0 ppm) in available boron occupy an area of about 245 ha (48%) in the northern and southeasternpart of the microwatersheds(Fig.6.7).

6.8 Available Iron

Available iron content is sufficient (>4.5 ppm) inan area of 104 ha (20%) and occur in the southern and southwestern part of the microwatersheds. An area of 370 ha (73%) is deficient (<4.5 ppm) and are distributed in the major part of the microwatersheds(Fig. 6.8).

6.9 Available Manganese

Available manganese content is sufficient (>1.0 ppm) in the entire microwatersheds area (Fig. 6.9).

6.10 Available Copper

Available copper content is sufficient (>0.2 ppm) in the entire microwatersheds area (Fig. 6.10).

6.11 Available Zinc

Available zinc content is sufficient (>0.6 ppm) in an area of 81 ha (16 %) and deficient (<0.6 ppm) in 393 ha (77%) in the microwatersheds(Fig. 6.11).

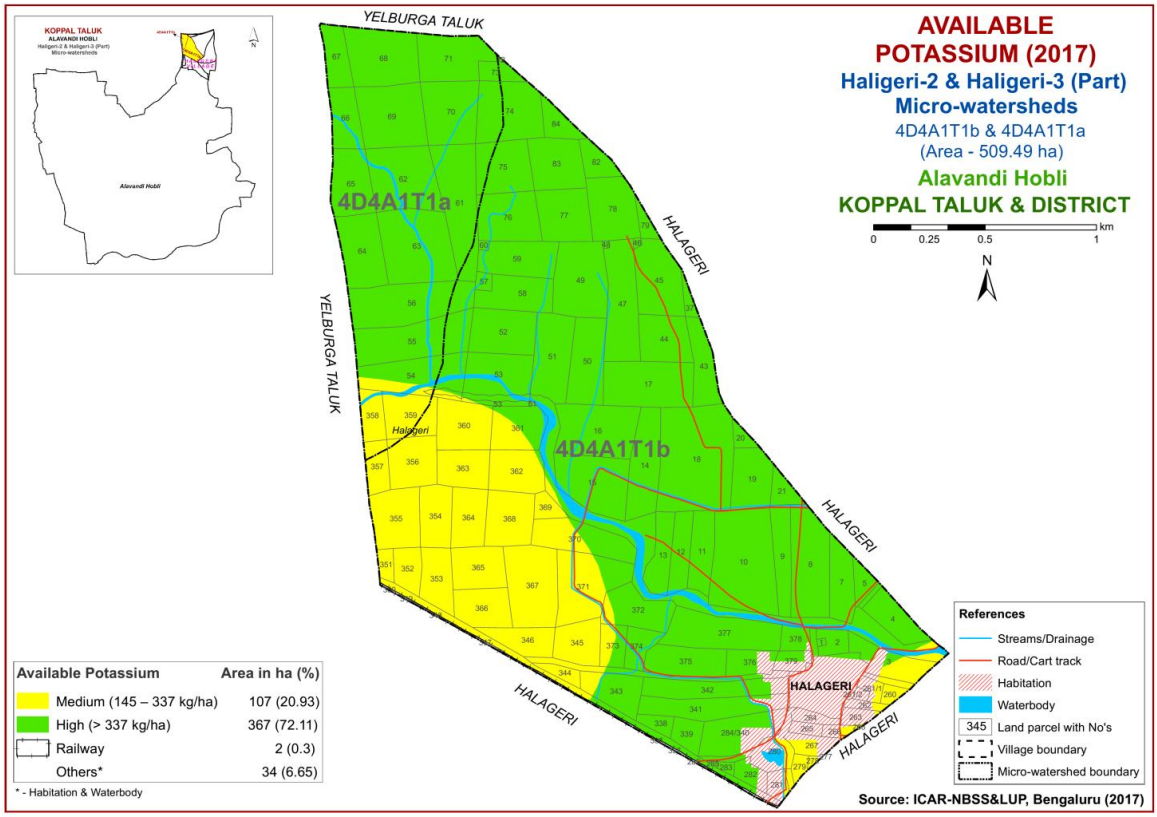


Fig.6.5Soil Available Potassium map of Haligeri-2 & Haligeri-3Microwatersheds

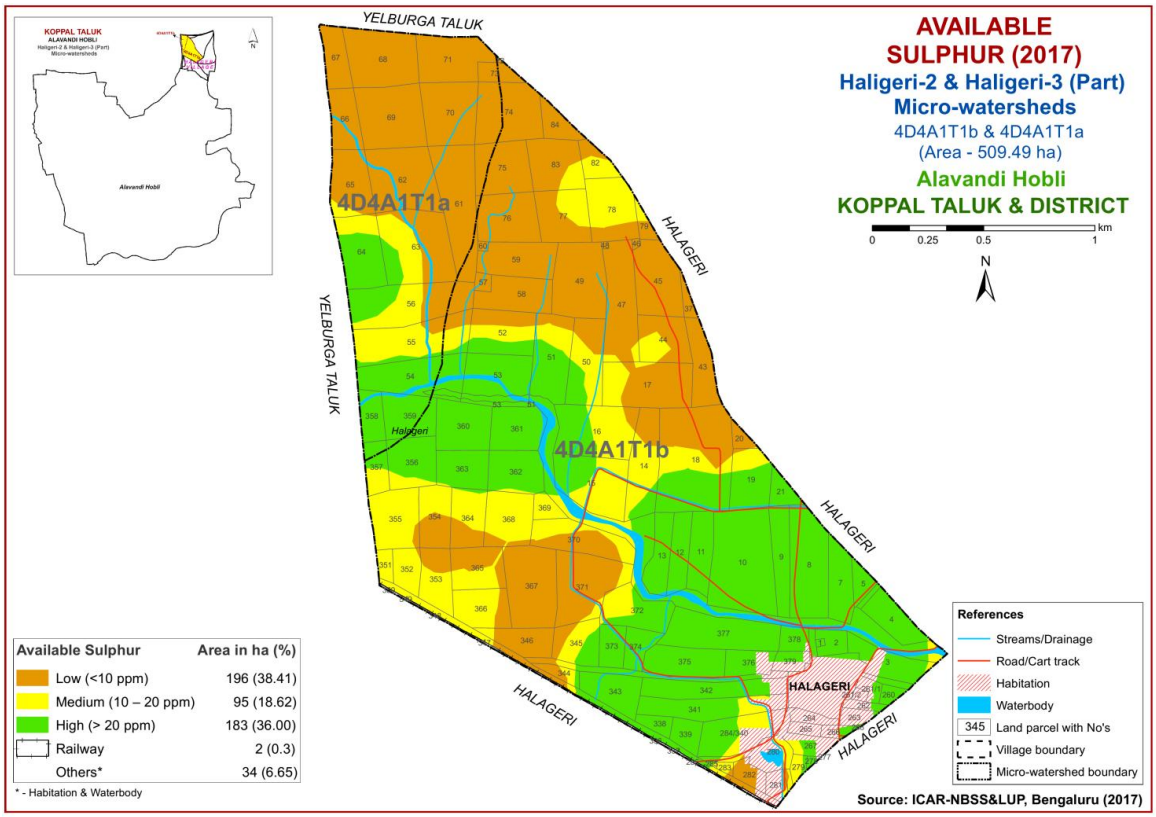


Fig.6.6Soil Available Sulphurmap of Haligeri-2 & Haligeri-3Microwatersheds

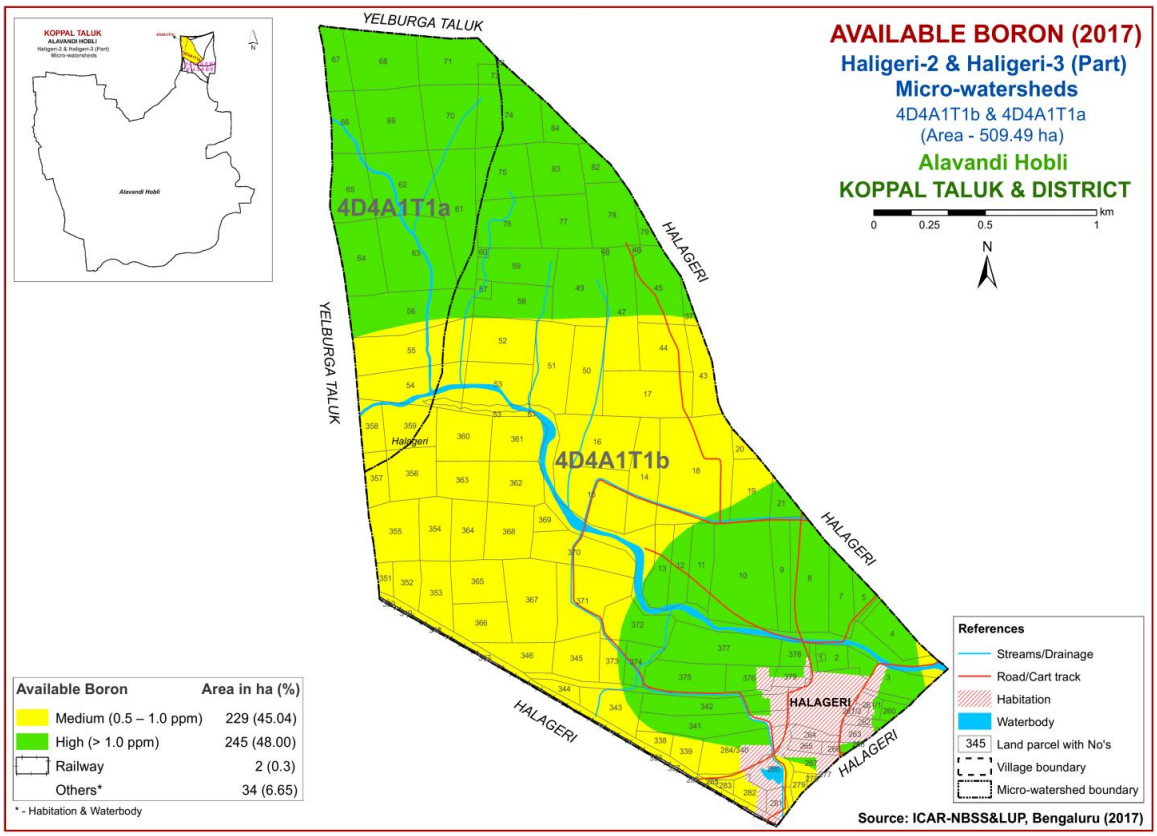


Fig.6.7Soil Available Boronmap of Haligeri-2 & Haligeri-3 Microwatersheds

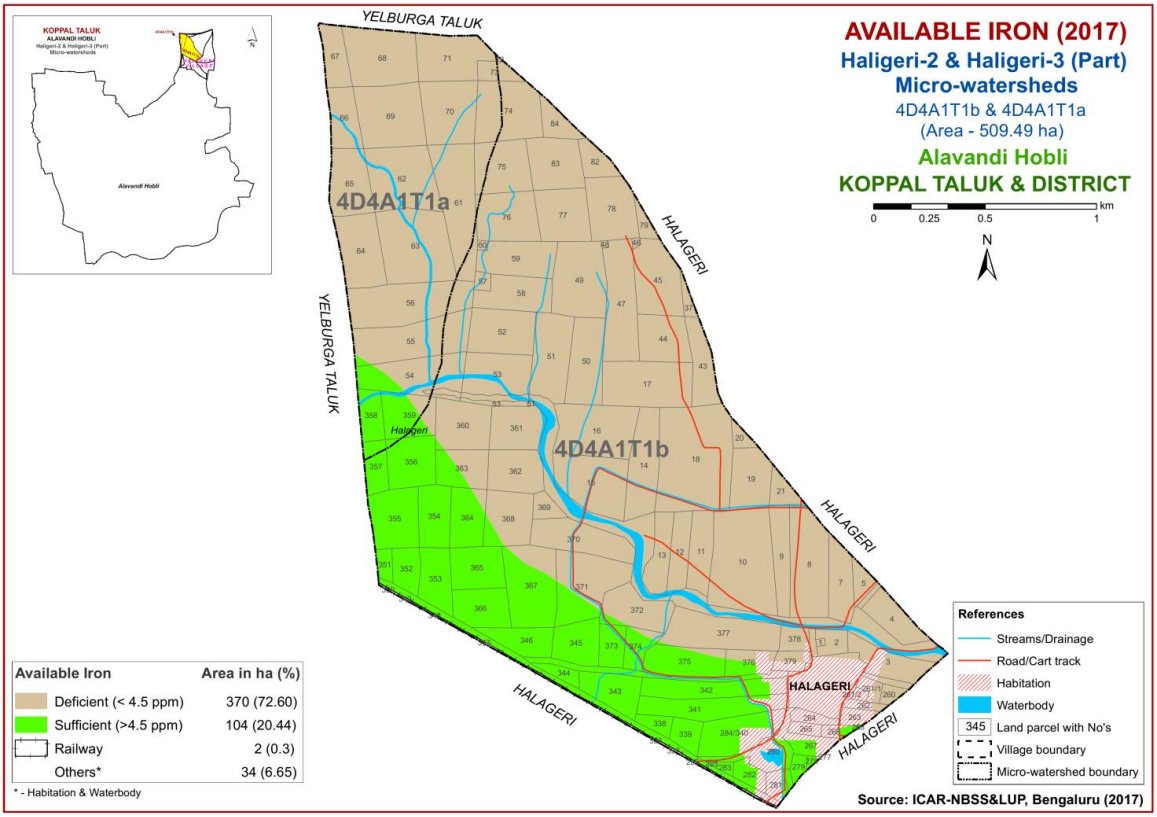


Fig.6.8Soil Available Iron map of Haligeri-2 & Haligeri-3Microwatersheds

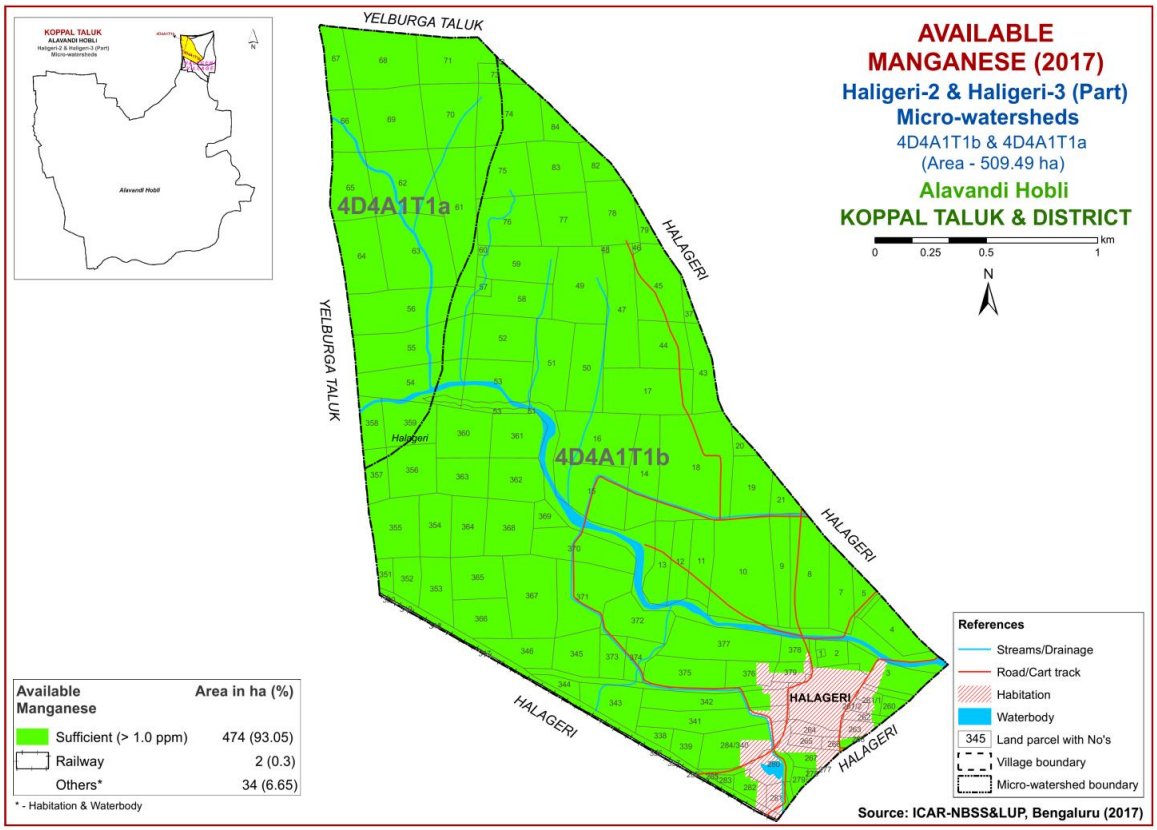


Fig.6.9Soil Available Manganese map of Haligeri-2 & Haligeri-3Microwatersheds

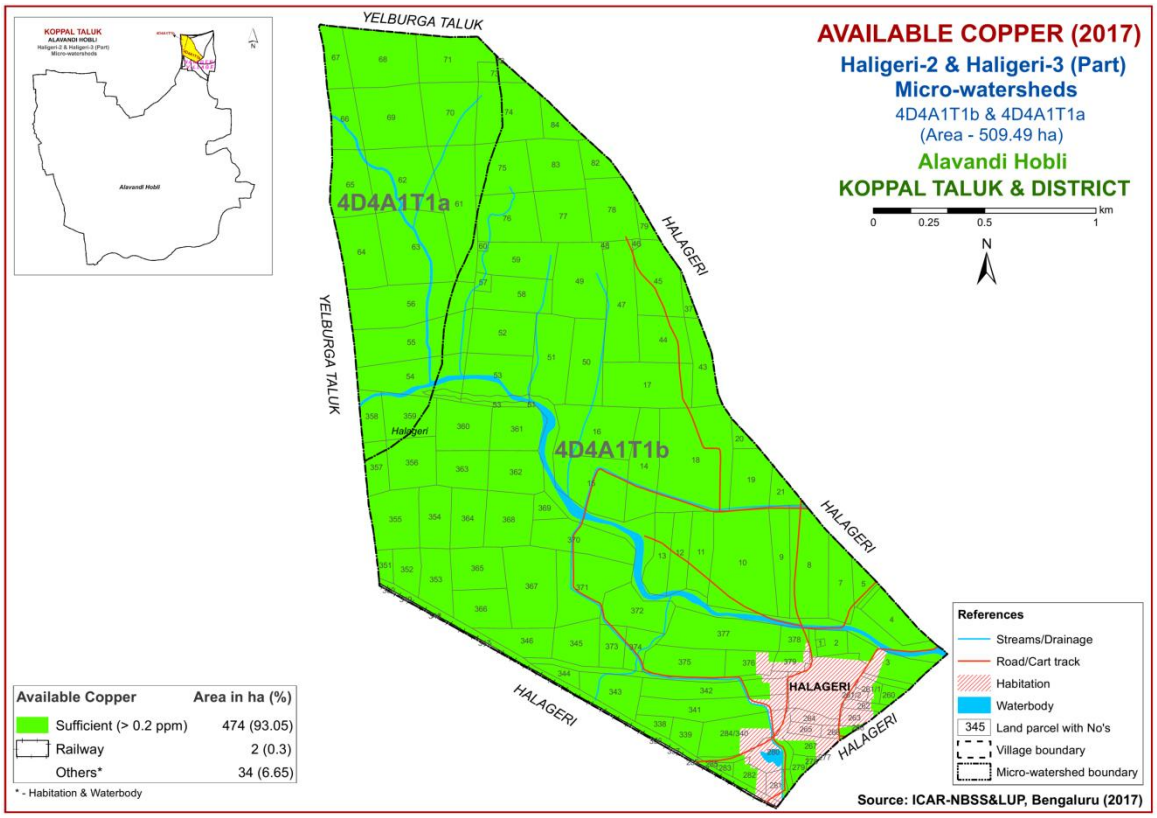


Fig.6.10Soil Available Copper map of Haligeri-2 & Haligeri-3Microwatersheds

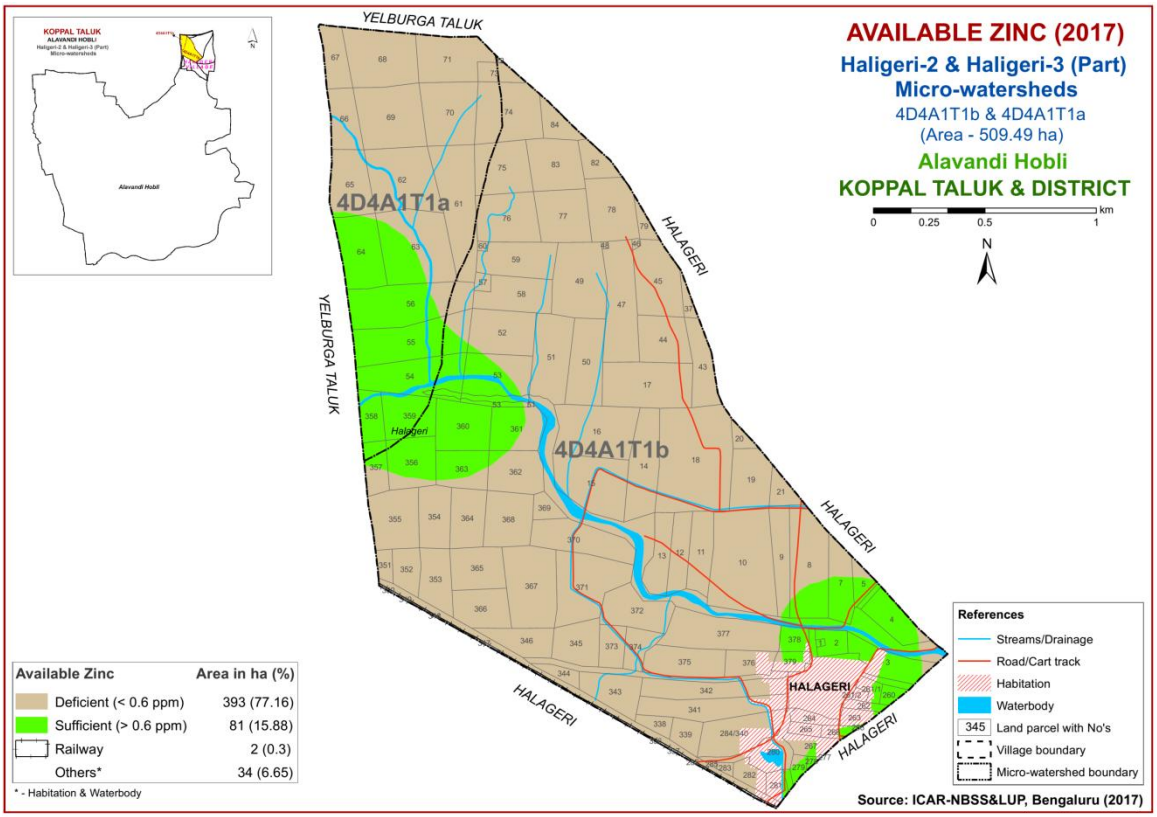


Fig.6.11Soil Available Zinc map of Haligeri-2 & Haligeri-3Microwatersheds

Chapter 7

LAND SUITABILITY FOR MAJOR CROPS

The soil and land resource units (soil phases) of Haligeri-2 & Haligeri-3 Microwatersheds were assessed for their suitability for growing food, fodder, fibre and other horticulture crops by following the procedure as outlined in FAO, 1976 and 1983. Crop requirements were developed for each of the crop from the available research data and also by referring to Naidu *et. al.* (2006) and Natarajan *et. al* (2015). The crop requirements were matched with the soil and land characteristics (Table 7.1) to arrive at the crop suitability. In FAO land suitability classification, two orders are recognized. Order S-Suitable and Order N- Not suitable. The orders have classes, subclasses and units. Order-S has three classes, Class S1-Highly Suitable, Class S2-Moderately Suitable and Class S3-Marginally Suitable. Order N has two Classes, N1-Currently not Suitable and N2-Permanently not Suitable. There are no subclasses within the Class S1 as they will have very minor or no limitations for crop growth. Classes S2, S3, N1 and N2 are divided into subclasses based on the kinds of limitations encountered. The limitations that affect crop production are 'c' for erratic rainfall and its distribution and length of growing period (LGP), 'e' for erosion hazard, 'r' for rooting condition, 't' for lighter or heavy texture, 'g' for gravelliness or stoniness, 'n' for nutrient availability, 'l' for topography, 'm' for moisture availability, 'z' for calcareousness, 's' for sodium and 'w' for drainage. These limitations are indicated as lower case letters to the class symbol. For example, moderately suitable lands with the limitations of soil depth and erosion are designated as S2re. For the microwatersheds, the soil mapping units were evaluated and classified up to subclass level.

Using the above criteria, the soil map units of the microwatersheds were evaluated and land suitability maps for 28major agricultural and horticultural crops were generated. The detailed information on the kind of suitability of each of the soil phase for the crops assessed are given village/ survey number wise for the microwatersheds in Appendix-III.

7.1 Land Suitability for Sorghum (*Sorghum bicolor*)

Sorghum is one of the major crops grown in Karnataka in an area of 10.47 lakh ha in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad, Bellary, Chitradurga, Mysore and Chamarajnagar districts. The crop requirements for growing sorghum (Table 7.2) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing sorghum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershedsare given in Figure. 7.1.

Highly suitable (Class S1) lands occupy an area of 105 ha (21%) for growing sorghumand are distributed in the southern, central and eastern part of the microwatersheds.An area of 139 ha (27%) is moderately suitable (ClassS2) for growing

Table 7.1 Soil-Site Characteristics of Haligeri-2 & Haligeri-3 Microwatersheds

Soil Map Units	Climate (P) (mm)	Growing period (Days)	Drainage Class	Soil depth (cm)	Soil texture		Gravelliness		AWC (mm/m)	Slope (%)	Erosion	pH	EC	ESP	CEC [Cmol $(p^+)kg^{-1}$]	BS (%)
					Surf -ace	Sub-surface	Sur-face	Sub-surface								
TDHhB2g2	662	90	WD	50-75	scl	c, sc	35-60	10-20	100-150	1-3	Moderate	9.19	0.18	14.57	3.57	100
BSRiB1g1	662	90	WD	75-100	sc	sc	15-35	15-35	50-100	1-3	Slight	-	-	-	-	-
BSRiB1g2	662	90	WD	75-100	sc	sc	35-60	15-35	50-100	1-3	Slight	-	-	-	-	-
CKMiA1	662	90	WD	75-100	sc	sc	-	10-15	100-150	0-1	Slight	7.99	0.32	4.33	12.50	119
MNLiB1g1	662	90	WD	100-150	sc	sc	15-35	15-35	101-150	1-3	Slight	7.89	0.13	5.04	9.01	101
MTLmB2	662	90	WD	25-50	c	c	-	10-15	50-100	1-3	Moderate	8.27	0.20	0.69	36.64	-
MTLmB2g1	662	90	WD	25-50	c	c	15-35	10-15	50-100	1-3	Moderate	8.27	0.20	0.69	36.64	-
NSPiB1g1	662	90	WD	75-100	sc	c	15-35	-	101-150	1-3	Slight	9.16	0.61	21.4	51.09	-
NSPmB2	662	90	MWD	75-100	c	c	-	-	101-150	1-3	Moderate	9.16	0.61	21.4	51.09	-

*Symbols and abbreviations are according to Field Guide for LRI under Sujala-III Project, Karnataka

sorghum and are distributed in the western, southern, central and southeastern partof the microwatersheds. They have minor limitations of gravelliness androoting condition. Maximum area of about 230 ha (45%) is marginally suitable (Class S3) for growing sorghum and aredistributed in the major part of the microwatersheds with moderate limitations of gravelliness, rooting condition and calcareousness.

Table 7.2 Crop suitability criteria for Sorghum

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	Class	Well to mod.Well drained	imperfect	Poorly/excessively	V.poorly
Soil reaction	pH	6.0-8.0	5.5-5.9,8.1-8.5	<5.5,8.6-9.0	>9.0
Surface soil texture	Class	c, cl, sicl, sc	l, sil, sic	sl, ls	s, fragmental skeletal
Soil depth	cm	100-75	50-75	30-50	<30
Gravel content	% vol.	5-15	15-30	30-60	>60
Salinity (EC)	dSm^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

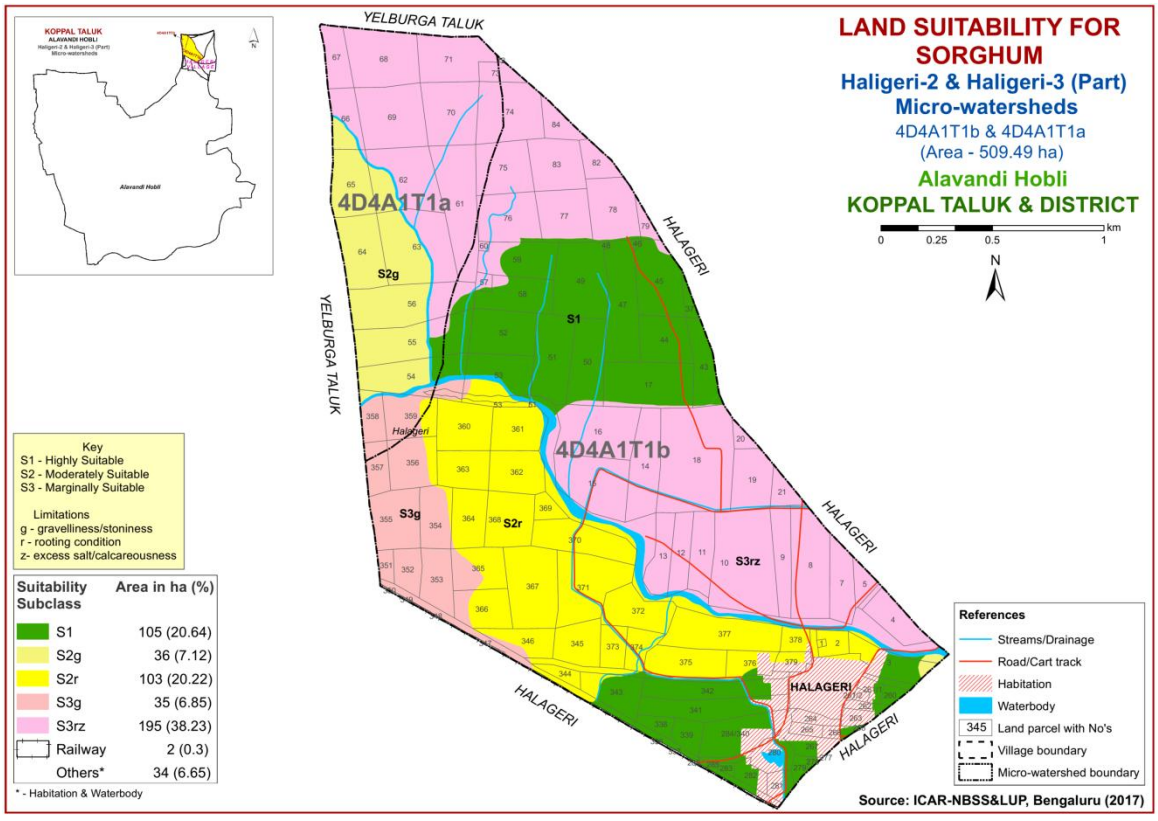


Fig. 7.1 Land Suitability map of Sorghum

7.2 Land Suitability for Maize (*Zea mays*)

Maize is one of the most important food crop grown in an area of 13.37 lakh ha in almost all the districts of the State. The crop requirements forgrowing maize (Table 7.3) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing maize was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.2.

Table 7.3 Crop suitability criteria for Maize

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3.5	5-8	
LGP	Days	>100	100-80	60-80	
Soil drainage	Class	Well drained	Mod. to imperfectly	Poorly/excessively	V.poorly
Soil reaction	pH	5.5-7.5	7.6-8.5	8.6-9.0	
Surface soil texture	Class	l, cl, scl, sil	sl, sicl, sic	c(s-s), ls	s,fragmental
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-50	>50
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	2.0-4.0	
Sodicity (ESP)	%	<10	10-15	>15	

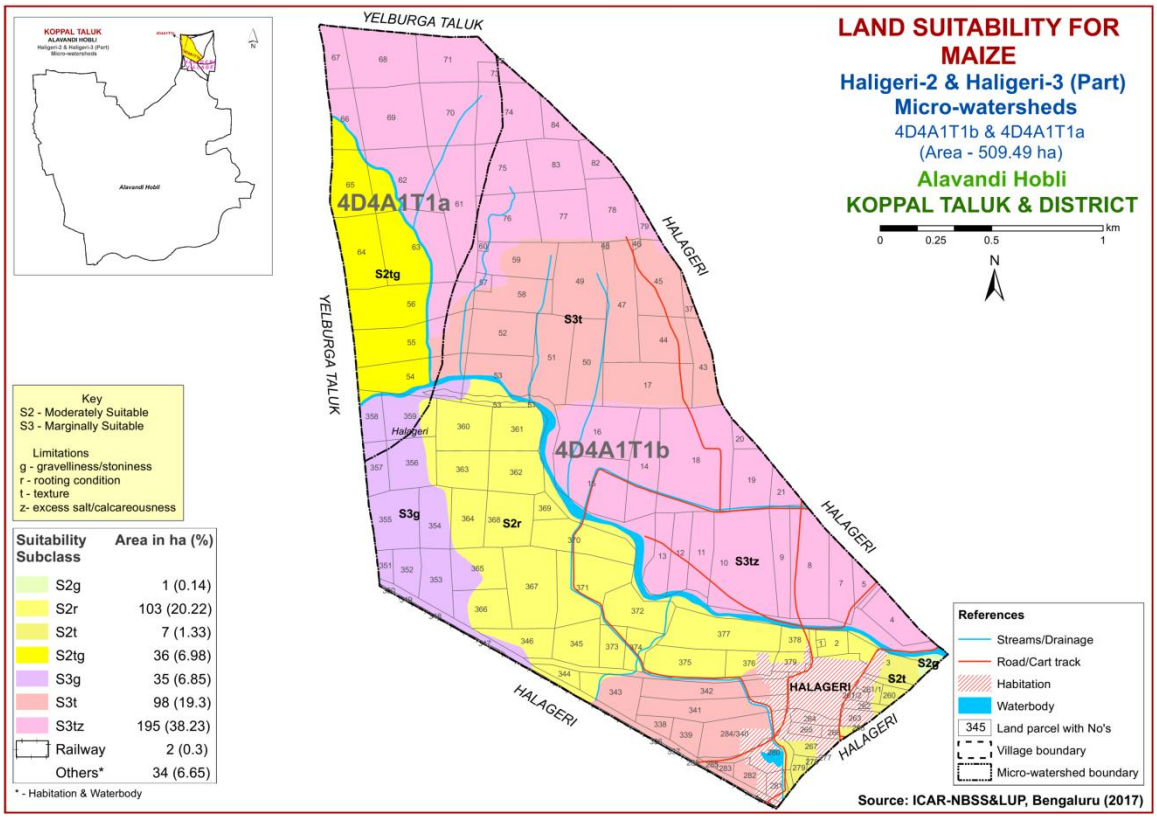


Fig. 7.2 Land Suitability map of Maize

There are no highly suitable (Class S1) lands for growing maize in the microwatersheds. An area of 147 ha (29%) is moderately suitable (Class S2) for growing

maize and are distributed in the southern, central, western and southeastern part of the microwatersheds.Marginally suitable (ClassS3) cover an area of 328 ha (64%) andare distributedin all parts ofthe microwatersheds. They havemoderate limitations of texture, gravelliness and calcareousness.

7.3Land Suitability for Bajra (*Pennisetum glaucum)*

Bajra is one of the major food crop grown in an area of 2.34 lakh ha in the northern districts of Karnataka State. The crop requirements for growing bajra(Table 7.4)were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing bajra was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.3.

An area of 43 ha (8%) is highly suitable (Class S1) for growing bajra. Moderately suitable (Class S2) lands occupy an area of 103 ha (20%) and are distributed in the southern, central and southeastern part of the microwatersheds with minor limitation of rooting condition. Marginally suitable (Class S3) lands cover a maximum area of 328 ha (64%) and are distributed in all parts of the microwatersheds. They have moderate limitations of gravelliness, rooting condition, calcareousness and texture.

Table 7.4 Crop suitability criteria for Bajra

Crop requirement		**Rating**			
Soil–site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately Suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	2-3	3-8	8-15	>15
LGP	Days	120-150	120-90	<90	
Soil drainage	Class	Well to mod well drained	imperfect	Poorly/ excessively	V.poorly
Soil reaction	pH	5.5-8.0	5.0-5.5,7.8-8.4	8.4-9.0	>9.0
Surface soil texture	Class	c (red), sicl, sc, sl, cl	l, c (black), scl, sil, sic	sl, ls	s,fragmental skeletal
Soil depth	cm	100-75	50-75	25-50	<25
Gravel content	% vol.	15-35	35-60	60-80	-
Salinity (EC)	dS m^{-1}	2-4	4-8	8-10	>10
Sodicity (ESP)	%	5-8	8-10	10-15	>15

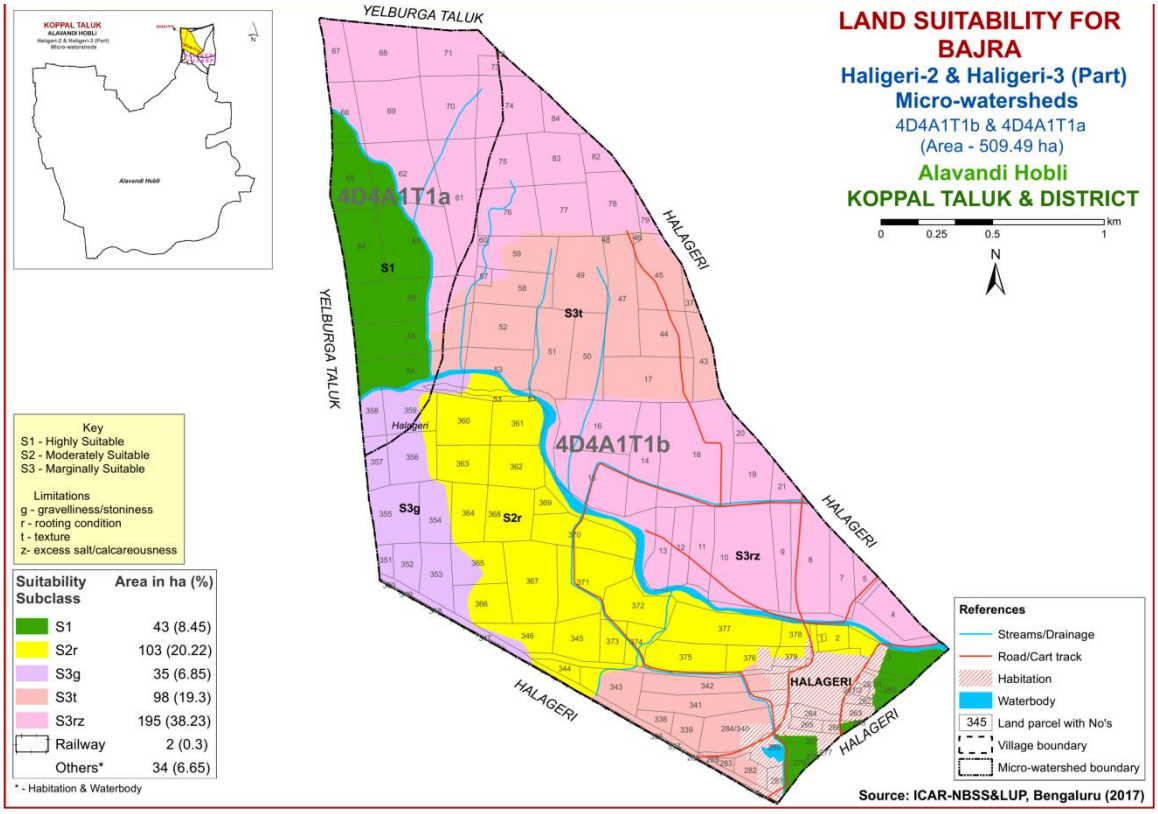


Fig. 7.3Land Suitability map of Bajra

7.4 Land Suitability for Red gram (*Cajanus cajan)*

Redgram is one of the most important pulse crop grown in an area of 7.28 lakh ha in almost all the districts of the State. The crop requirements for growing redgram (Table 7.5) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing redgram was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.4.

There are no highly suitable (Class S1) lands for growing redgramin the microwatersheds. Moderately suitable (Class S2) occupy an area of 142 ha (28%) and are distributed in the eastern, central, southern and western part of the microwatersheds with minor limitations of gravelliness, rooting condition and texture. Marginally suitable (Class S3) lands cover an area of about 138 ha (27%) and are distributed in the southern and western part of the microwatersheds. They have moderate limitations of gravelliness and rooting condition.Not suitable (Class N1) cover an area of 195 ha (38%) for growing redgram and are distributed in the northern and eastern part of the microwatersheds with severe limitations of texture and rooting condition.

Table 7.5Land suitability criteria for Red gram

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable (S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>210	180-210	150-180	<150
Soil drainage	Class	Well drained	Mod. well drained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.5-7.5	5.0-6.5,7.6-8.0	8.0-9.0	>9.0
Sub Surface soil texture	Class	l, scl, sil, cl, sl	sicl, sic, c(m)	ls	
Soil depth	cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	3-60	>60
Salinity (EC)	dS m^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

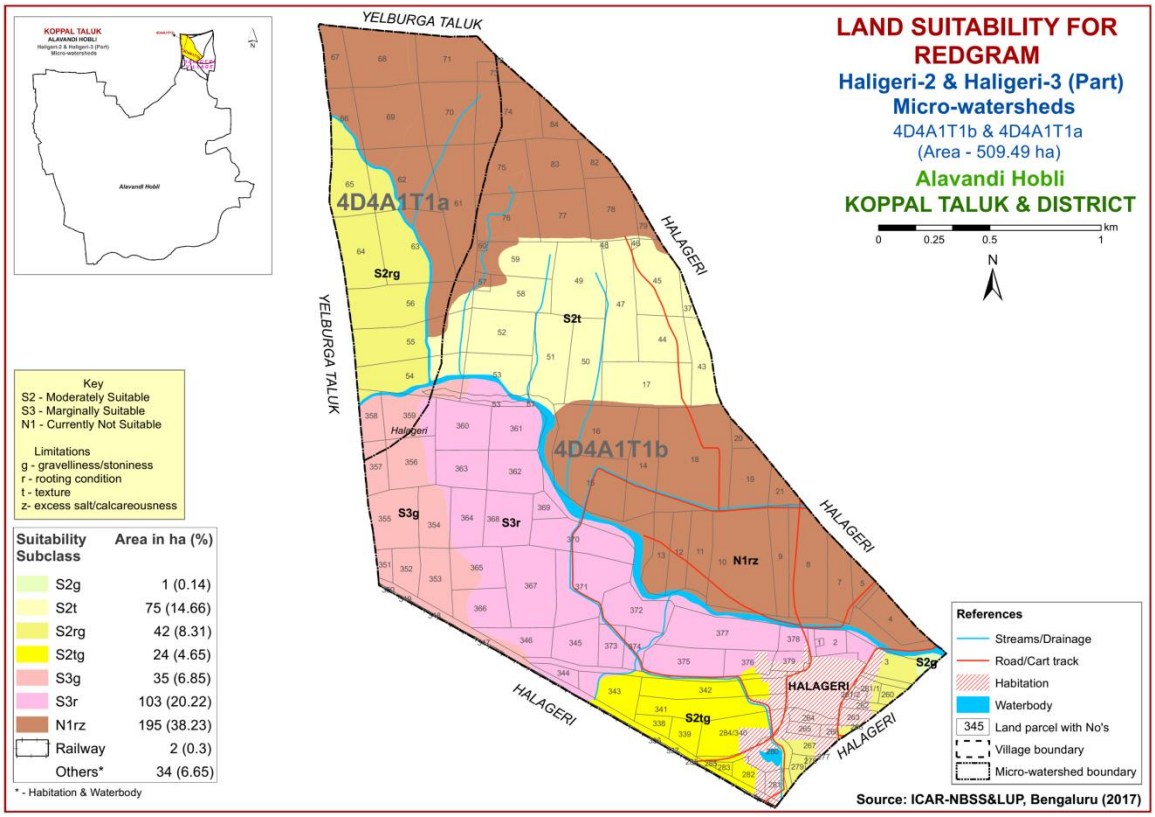


Fig. 7.4 Land Suitability map of Redgram

7.5 Land Suitability for Bengalgram (*Cicer arietinum*)

Bengalgram is one of the major pulse crop grown in an area of 9.39 lakh ha in northern Karnataka in Bijapur, Gulbarga, Raichur, Bidar, Belgaum, Dharwad and Bellary districts. The crop requirements for growing Bengalgram (Table 7.6) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing Bengalgram was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.5.

Highly suitable (Class S1) lands cover an area of 98 ha (19%) and are distributed in the central, eastern and southern part of the microwatersheds. Moderately suitable lands occurin an area of 146 ha (29%) and are distributed in the western, southern, central and southeastern part of the microwatersheds with minor limitations of gravelliness, texture and rooting condition. Marginally suitable (Class S3) landscover a maximum area of 230 ha (45%) and are distributed in the northern, eastern and western part of the microwatersheds. They have moderate limitations of gravelliness, rooting condition and calcareousness.

Table 7.6 Crop suitability criteria for Bengalgram

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>100	90-100	70-90	<70
Soil drainage	class	Well drained	Mod. to well drained; Imper drained	Poorly drained; excess drained	Very Poorly drained
Soil reaction	pH	6.0-7.5	5.5-5.77.6-8.0	8.1-9.0;4.5-5.4	>9.0
Surface soil texture	Class	l, scl, sil, cl,	sicl, sic, c	sl, c>60%	s,fragmental
Soil depth	cm	>75	51-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity(ESP)	%	<10	10-15	>15	

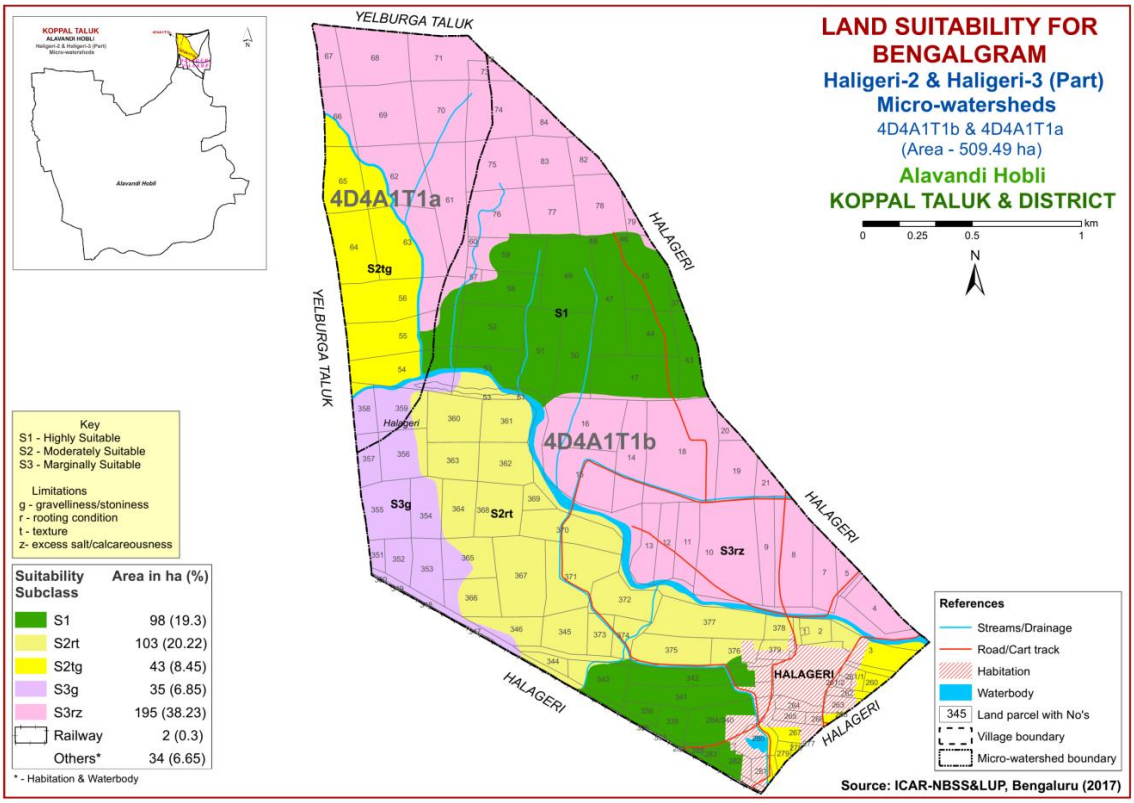


Fig. 7.5 Land Suitability map of Bengalgram

7.6 Land Suitability for Groundnut (*Arachis hypogaea*)

Groundnut is one of the major oilseed crop grown in an area of 6.54 lakh ha in Karnataka in most of the districts either as rainfed or irrigated crop. The crop requirements for growing groundnut (Table 7.7) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing groundnut was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.6.

Table 7.7 Crop suitability criteria for Groundnut

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	100-125	90-105	75-90	
Soil drainage	Class	Well rained	Mod. Well drained	Imperfectly drained	Poorly drained
Soil reaction	pH	6.0-8.0	8.1-8.5,5.5-5.9	>8.5,<5.5	
Surface soil texture	Class	l, cl, sil, sc, sicl	sc, sic, c,	s, ls, sl c (>60%)	s,fragmental
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<35	35-50	>50	
$CaCO_3$ in root zone	%	high	Medium	low	
Salinity (EC)	dSm^{-1}	<2.0	2.0-4.0	4.0-8.0	
Sodicity (ESP)	%	<5	5-10	>10	

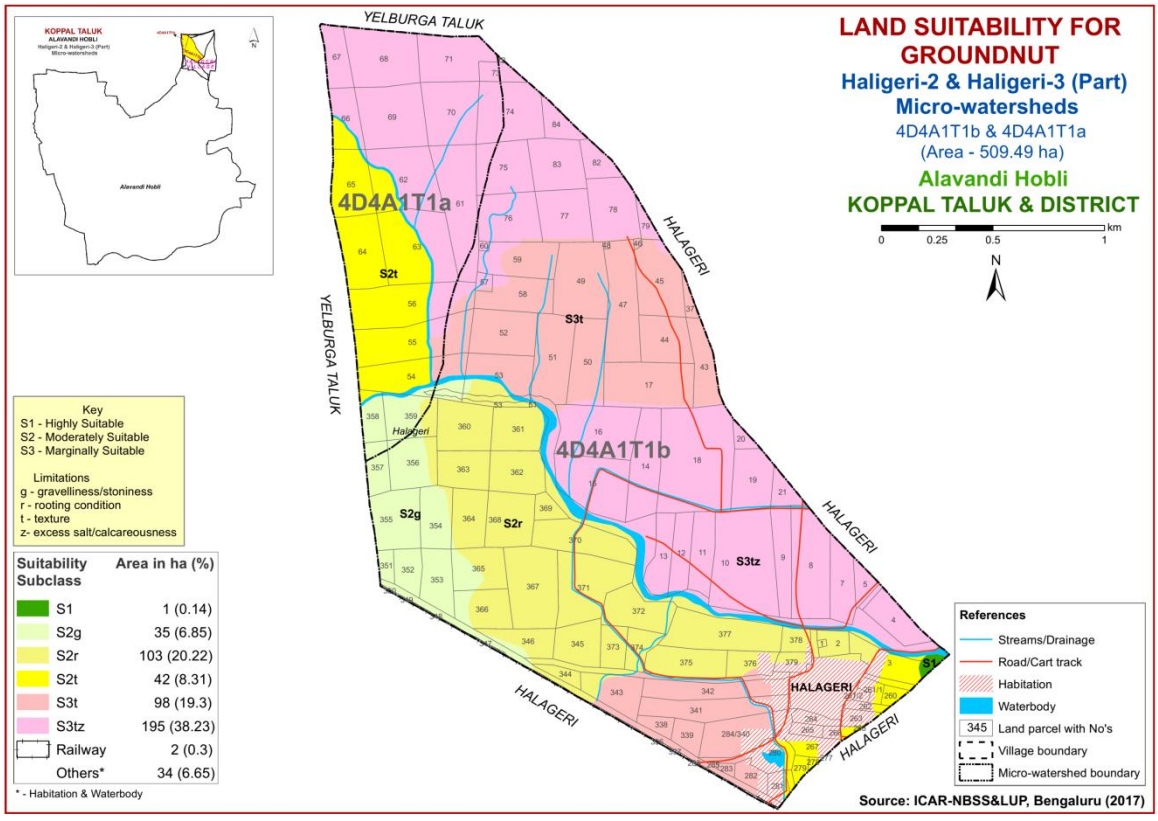


Fig. 7.6 Land Suitability map of Groundnut

A minor area of 1 ha (<1%) is highly suitable (Class S1) for growing groundnutand are distributed in the southeastern part of the microwatersheds. Moderately suitable (Class S2) lands cover anarea of 180 ha (35%) and are distributed in the western, southwestern, central and southeastern part of the microwatersheds. They have minor limitations of rooting depth, texture and gravelliness. Anarea of 293 ha (58%) is marginally suitable (Class S3) for groundnut and are distributed in the major part of the microwatersheds. They have moderate limitations of calcareousness and texture.

7.7 Land Suitability for Sunflower (*Helianthus annus*)

Sunflower is one of the most important oilseed crop grown in an area of 3.56 lakh ha in the State in all the districts. The crop requirements for growing sunflower (Table 7.8) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sunflower was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.7.

There are no highly suitable (Class S1) lands in the microwatershedsfor growing sunflower in the microwatersheds. An area of 177 ha (35%) is moderately suitable (Class S2)for growing sunflower and are distributed in the western, central, eastern southern and southeasternpart of the microwatersheds. They have minor limitations of rooting conditionand gravelliness. An area of 103 ha (20%) is marginally suitable (Class S3) for growing sunflower and are distributed in the central, southern and southeastern part of the microwatershedswith moderate limitation of rooting condition. Not suitable (Class N1)lands cover an area of 195 ha (38%) and are distributed in the northern and eastern part of the microwatersheds with severe limitations of rooting condition and calcareousness.

Table 7.8 Crop suitability criteria for Sunflower

Crop requirement		**Rating**			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Slope	%	<3	3-5	5-10	>10
LGP	Days	>90	80-90	70-80	<70
Soil drainage	class	Well drained	mod. Well drained	imperfectly drained	Poorly drained
Soil reaction	pH	6.5-8.0	8.1-8.5,5.5-6.4	8.6-9.0;4.5-5.4	>9.0, <4.5
Surface soil texture	Class	l, cl, sil, sc	scl, sic, c,	c (>60%), sl	ls, s
Soil depth	cm	>100	75-100	50-75	<50
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (EC)	dSm^{-1}	<1.0	1.0-2.0	>2.0	
Sodicity (ESP)	%	<10	10-15	>15	

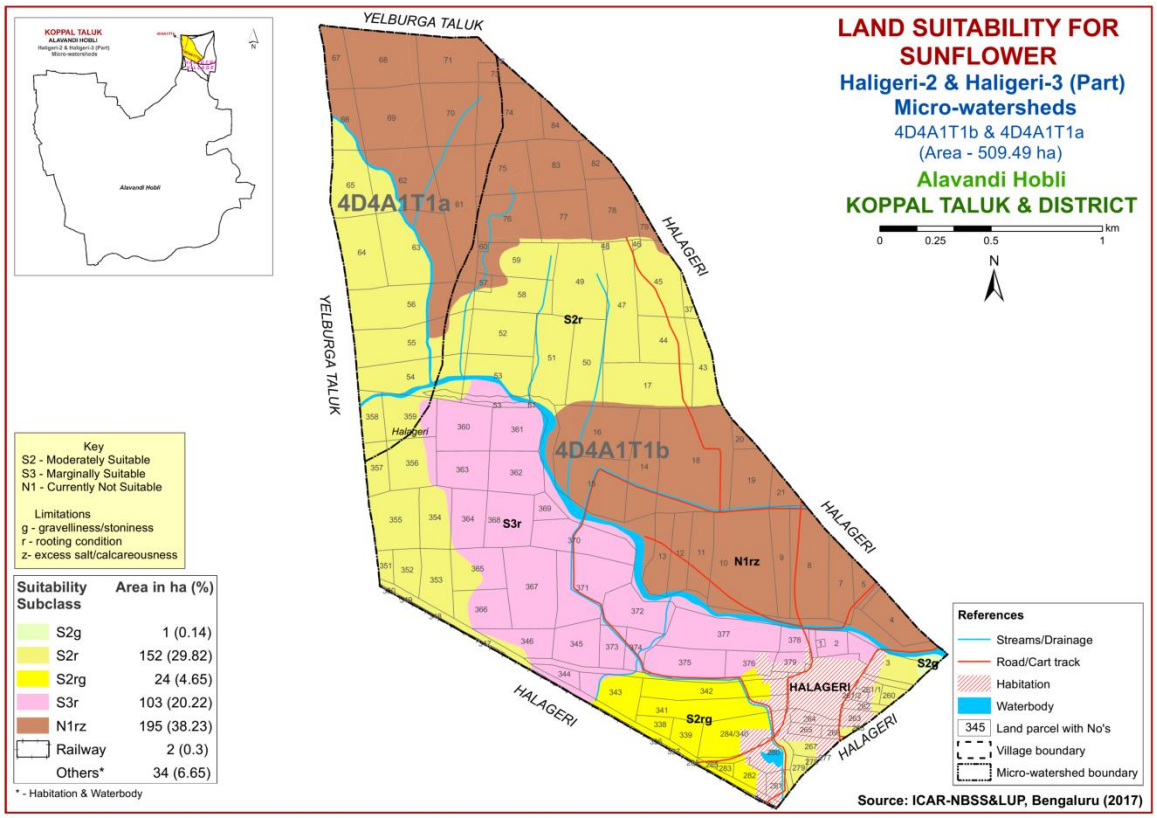


Fig. 7.7 Land Suitability map of Sunflower

7.8 Land Suitability for Cotton (*Gossypiumhirsutum*)

Cotton is one of the most important fibre crop grown in the State in about 8.75 lakh ha area in Raichur, Dharwad, Belgaum, Gulbarga, Bijapur, Bidar, Bellary, Chitradurga and Chamarajnagar districts. The crop requirements for growing cotton (Table 7.9) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cotton was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.8.

An area of 98 ha (19%) is highly suitable (Class S1) for growing cotton and are distributed in the eastern, central and southern part of the microwatersheds.Moderately suitable (Class S2) lands occurin an area of 146 ha (29%) and are distributed in the western, central, southeastern and southern part of the microwatersheds. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3)landscover a major area of 230 ha (45%) and are distributed in the northern, eastern and western part of the microwatersheds. They have moderate limitations of gravelliness, calcareousness and rooting condition.

Table 7.9 Crop suitability criteria for Cotton

Crop requirement		Rating			
Soil–site characteristics	**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable (N)**
Slope	%	1-2	2-3	3-5	>5
LGP	Days	180-240	120-180	<120	
Soil drainage	class	Well to moderately well	Imperfectly drained	Poor somewhat excessive	Stagnant/ Excessive
Soil reaction	pH	6.5-7.5	7.6-8.0	8.1-9.0	>9.0>6.5
Surface soil texture	Class	sic, c	sicl, cl	si, sil, sc, scl, l	sl, s,ls
Soil depth	cm	100-150	60-100	30-60	<30
Gravel content	% vol.	<5	5-10	10-15	15-35
$CaCO_3$ in root zone	%	<3	3-5	5-10	10-20
Salinity (EC)	dSm^{-1}	2-4	4.0-8.0	8.0-12	>12
Sodicity (ESP)	%	5-10	10-20	20-30	>30

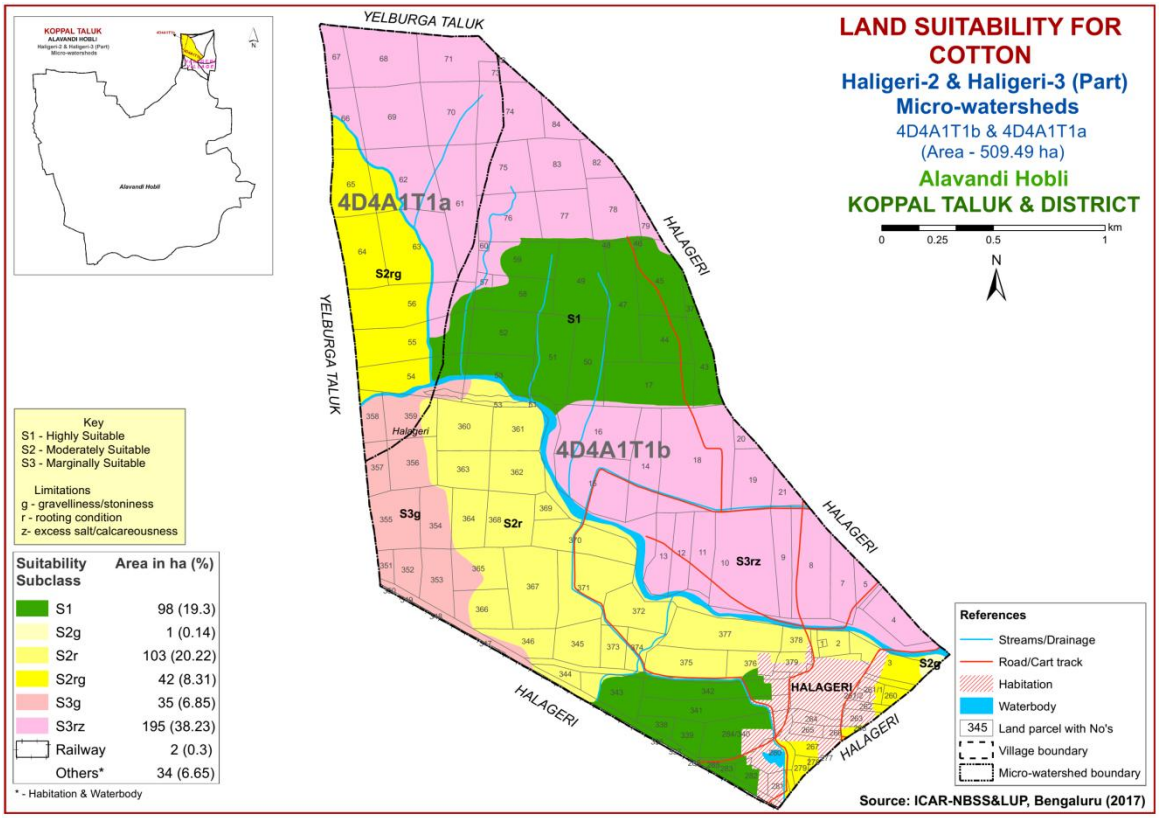


Fig. 7.8 Land Suitability map of Cotton

7.9Land Suitability for Chilli (*Capsicum annuum L*)

Chilli is one of the most important commercialcrop grown in an area of 0.89 lakh ha in all the districts of Karnataka State. The crop requirements for growing chilli (Table 7.10) were matched with the soil-site characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing chilli was generated. The area

extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.9.

Table 7.10Crop suitability criteria for Chilli

Crop requirement		Rating			
Soil –site characteristics	**Unit**	**Highly suitable (S1)**	**Moderately suitable (S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Mean temperature in growing season	^{0}C	20-30	30-35 13-15	35-40 10-12	>40 <10
Slope	%	<3	3-5	5-10	>10
LGP	Days	>150	120-150	90-120	<90
Soil drainage	Class	Well drained	Moderately drained	Imp./poor drained /excessively	Very poorly drained
Soil reaction	pH	6.5-7.8,6.0-7.0	7.8-8.4	8.4-9.0,5.0-5.9	>9.0
Surface soil texture	Class	scl, cl, sil	sl, sc, sic,c(m/k)	c(ss), ls, s	
Soil depth	cm	>75	50-75	25-50	<25
Gravel content	% vol.	<15	15-35	35-60	>60
Salinity (ECe)	dS m^{-1}	<1.0	1.0-2.0	2.0-4.0	<4
Sodicity (ESP)	%	<5	5-10	10-15	

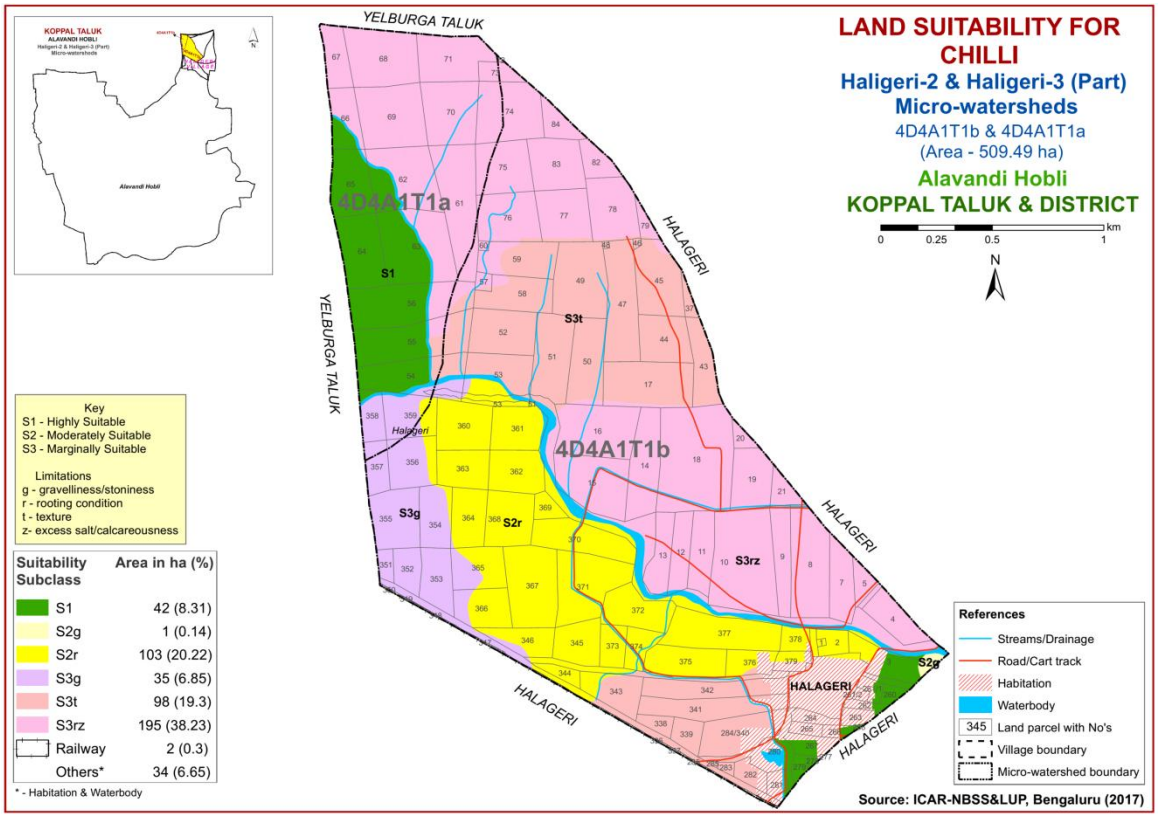


Fig. 7.9 Land Suitability map of Chilli

Highly suitable (Class S1)lands occupy an area of 42 ha (8%) and are distributed in the southern, western and southeastern part of the microwatershedsfor growing chilli. Moderately suitable (Class S2) lands cover an area of 104 ha (20%) and are distributed in

the central, southern and southeastern part of the microwatersheds. They have minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) landscover a maximum area of about 328 ha (64%) and are distributed in the major part of the microwatersheds. They have moderate limitations of gravelliness, texture, calcareousness and rooting condition.

7.10Land Suitability for Tomato (*Solanum lycopersicum*)

Tomato is one of the most important vegetable crop grown in an area of 0.65 lakh ha in almost all the districts of the State. The crop requirements (Table 7.11) for growing tomato were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tomato was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.10.

An area of 42 ha (8%) is highly suitable (Class S1) for growing tomato and are distributed in the western, southern and southeastern part of the microwatersheds.Moderately suitable (Class S2) lands occurin an area of 104 ha (20%) and are distributed in the central, southern and southeastern part of the microwatersheds with minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) cover a maximum area of 328 ha (64%) and occur in the major part of the microwatersheds. They have moderate limitations of gravelliness, texture, rooting condition, drainage and calcareousness.

Table 7.11 Crop suitability criteria for Tomato

Crop requirement			**Rating**			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	25-28	29-32 20-24	15-19 33-36	<15 >36
Soil moisture	Growing period	Days	>150	120-150	90-120	
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l, sl, cl, scl	sic, sicl, sc, c(m/k)	c (ss)	ls, s
	pH	1:2.5	6.0-7.0	5.0-5.9,7.1-8.5	<5;>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	%vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	slight	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	>10

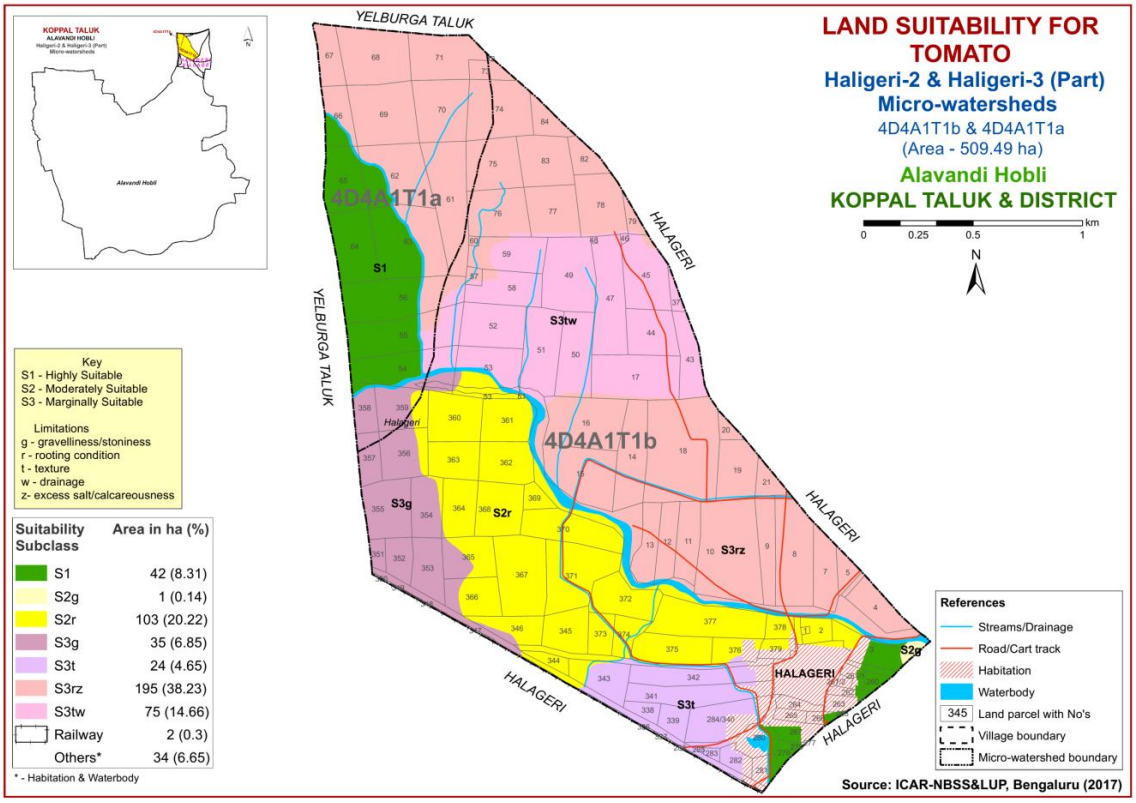


Fig. 7.10 Land Suitability map of Tomato

7.11 Land Suitability for Drumstick (*Moringa oleifera)*

Drumstick is one of the most important vegetable crop grown in 2403 ha area in the State. The crop requirements for growing drumstick (Table 7.12) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing drumstick was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.11.

There are no highly suitable (Class S1) lands for growing drumstickin the microwatersheds.Moderately suitable (Class S2) landsoccurin an area of 141 ha (28%) and are distributed in thewestern, central, eastern, southern and southeastern part of the microwatersheds. They have minor limitations of gravelliness, rooting condition and texture.Marginally suitable (Class S3)landscoveranarea of 138 ha (27%) and are distributed in the western, southern and southwesternpart of the microwatersheds.They have moderate limitations of rooting condition and gravelliness. Not suitable (Class N1) landscover an area of 195 ha (38%) and are distributed in the northern and eastern part of the microwatersheds with severe limitations of rooting condition and calcareousness.

Table 7.12 Land suitability criteria for Drumstick

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	sc, scl, cl, c (red)	sl, c (black)	ls	s
	pH	1:2.5	5.5-6.5	5-5.5,6.5-7.3	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	0-35	35-60	60-80	>80
Erosion	Slope	%	0-3	3-10	-	>10

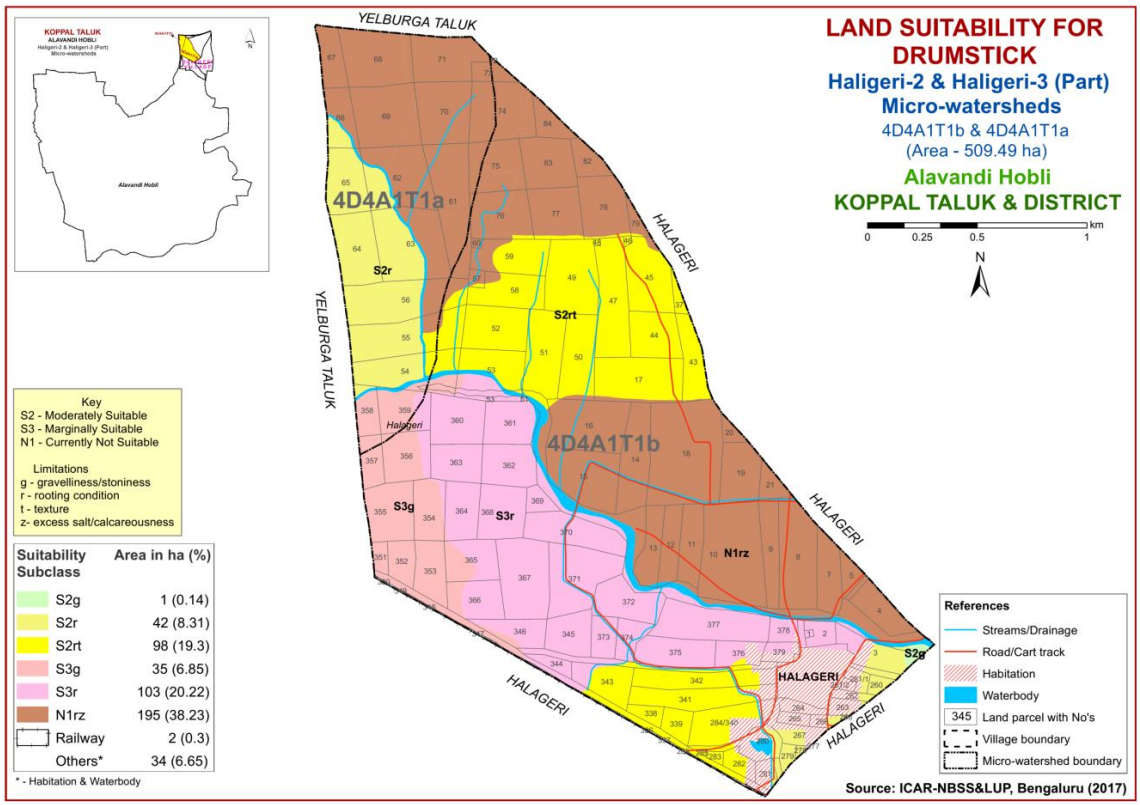


Fig. 7.11 Land Suitability map of Drumstick

7.12Land Suitability for Mulberry (*Morus nigra*)

Mulberry is one of the most important leaf crop grownfor rearing silkworms inabout 1.66 lakh ha in all the districts of the State. The crop requirements for growing mulberry (Table 7.13) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mulberry was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.12.

Highly suitable (Class S1) lands cover a minor area of 1 ha (<1%) for growing mulberry and are distributed in the southeastern part of the microwatersheds.Moderately

suitable (Class S2)landsoccurin anarea of 176 ha (34%) and are distributed in the western, southern, central, southeastern and eastern part of the microwatersheds. They have minor limitations of gravelliness, rooting condition, drainage and texture. Marginally suitable (Class S3) landscover an area of 103 ha (20%) and occur in the central and southernpart of the microwatersheds. They have moderate limitation of rooting condition. An area of 195 ha (38%) is not suitable (N1) and are distributed in the northern and eastern part of the microwatersheds with severe limitations of rooting condition and calcareousness.

Table 7.13 Land suitability criteria for Mulberry

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	sc, cl, scl	c (red)	c (black), sl, ls	-
	pH	1:2.5	-	-	-	-
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	0-35	35-60	60-80	>80
Erosion	Slope	%	0-3	3-5	5-10	>10

Note: Suitability evaluation only for Mulberry leaf not for Silk worm rearing

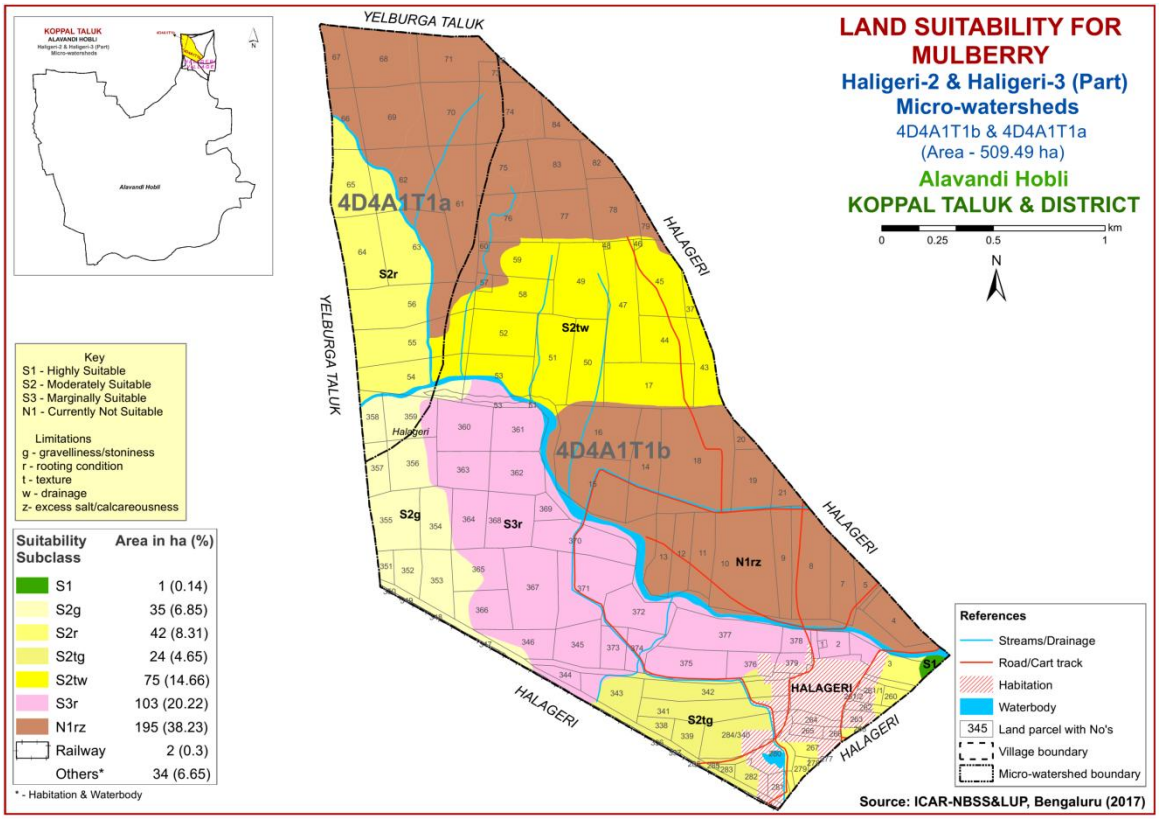


Fig. 7.12 Land Suitability map of Mulberry

7.13 Land Suitability for Mango (*Mangifera indica*)

Mango is one of the most important fruit crop grown in about 1.73 lakh ha in almost all the districts of the State. The crop requirements (Table 7.14) for growing mango were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing mango was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.13.

There are no highly suitable (Class S1)lands for growing mangoin the microwatersheds. A minorarea of 1 ha (<1%) is moderately suitable (Class S2) and are distributed in the southeastern part of the microwatersheds with minor limitations of gravelliness and rooting condition. Marginally suitable (Class S3) landscover an area of 175 ha (34%) and occur in the western, central, eastern and southern part of the microwatersheds. They have moderate limitations of rooting condition, texture and gravelliness.A maximum area of 298 ha (58%) is not suitable (Class N1) for growing mango and occur in the northern, central, southern, eastern andsoutheastern part of the microwatersheds with severe limitations of texture androoting condition.

Table 7.14 Crop suitability criteria for Mango

Crop requirement			**Rating**			
Soil-site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable (S3)**	**Not suitable(N)**
Climate	Temp. in growing season	^{0}C	28-32	24-27, 33-35	36-40	20-24
	Min. temp. before flowering	^{0}C	10-15	15-22	>22	
Soil moisture	Growing period	Days	>180	150-180	120-150	<120
Soil aeration	Soil drainage	Class	Well drained	Mod. To imp. drained	Poor drained	V.poorly drained
	Water table	M	>3	2.50-3.0	2.5-1.5	<1.5
Nutrient availability	Texture	Class	sc, l, sil, cl	sl,sc,sic,l,c	c (<60%)	c (>60%),
	pH	1:2.5	5.5-7.5	7.6-8.55.0-5.	8.6-9.04.0-4.9	>9.0,<4.0
	OC	%	High	medium	low	
	$CaCO_3$ in root zone	%	Non calcareous	<5	5-10	>10
Rooting conditions	Soil depth	cm	>200	125-200	75-125	<75
	Gravel content	%vol	Non-gravelly	<15	15-35	>35
Soil toxicity	Salinity	dS/m	Non saline	<2.0	2.0-3.0	>3.0
	Sodicity	%	Non sodic	<10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

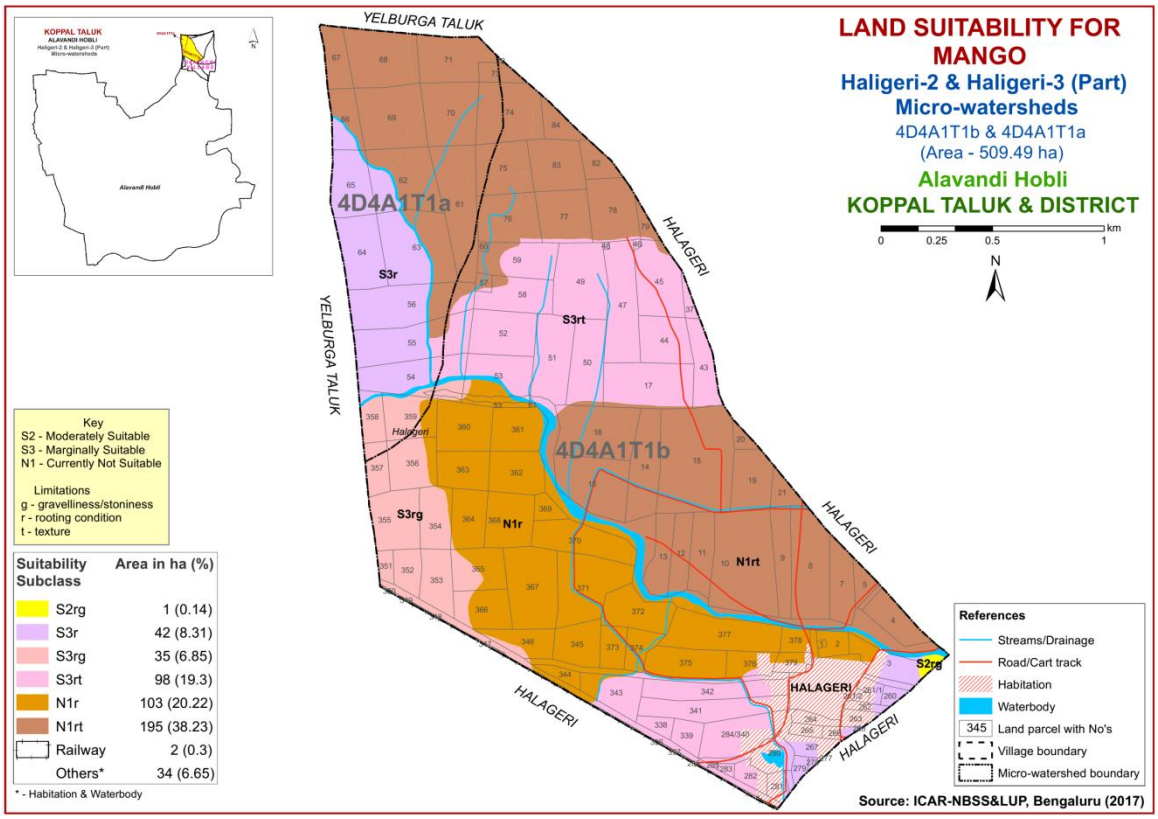


Fig. 7.13 Land Suitability map of Mango

7.14 Land Suitability for Sapota (*Manilkara zapota*)

Sapota is one of the most important fruit crop grown in an area of about 29373 ha in almost all the districts of the State. The crop requirements (Table 7.15) for growing sapota were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing sapota was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.14.

There are no highly suitable (Class S1) lands for growing sapota in the microwatersheds. An area of 43 ha (8%) is moderately suitable (Class S2) for growing sapota and are distributed in thewestern, southern and southeastern part of the microwatersheds with minor limitations of gravelliness and rooting condition. Marginally suitable (Class S3) landscover a maximum area of 236 ha (46%) and occur in the major part of the microwatersheds. They have moderate limitations of rooting condition, gravellinessand texture.An area of 195 ha (38%) is not suitable (Class N1) for growing sapota and occur in the northern and easternpart of the microwatersheds with severe limitations of calcareousness and rooting condition.

Table 7.15 Crop suitability criteria for Sapota

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0} C	28-32	33-36, 24-27	37-42, 20-23	>42,<18
Soil moisture	Growing period	Days	>150	120-150	90-120	<120
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	scl, l, cl, sil	sl, sicl, sc	c (<60%)	ls,s,c(>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0,5.0-5.9	8.1-9.0,4.5-4.9	>9.0,<4.5
	$CaCO_3$ in root zone	%	Non calcareous	<10	10-15	>15
Rooting conditions	Soil depth	cm	>150	75-150	50-75	<50
	Gravel content	% vol.	Non gravelly	<15	15-35	<35
Soil toxicity	Salinity	dS/m	Non saline	Up to 1.0	1.0-2.0	2.0-4.0
	Sodicity	%	Non sodic	10-15	15-25	>25
Erosion	Slope	%	<3	3-5	5-10	>10

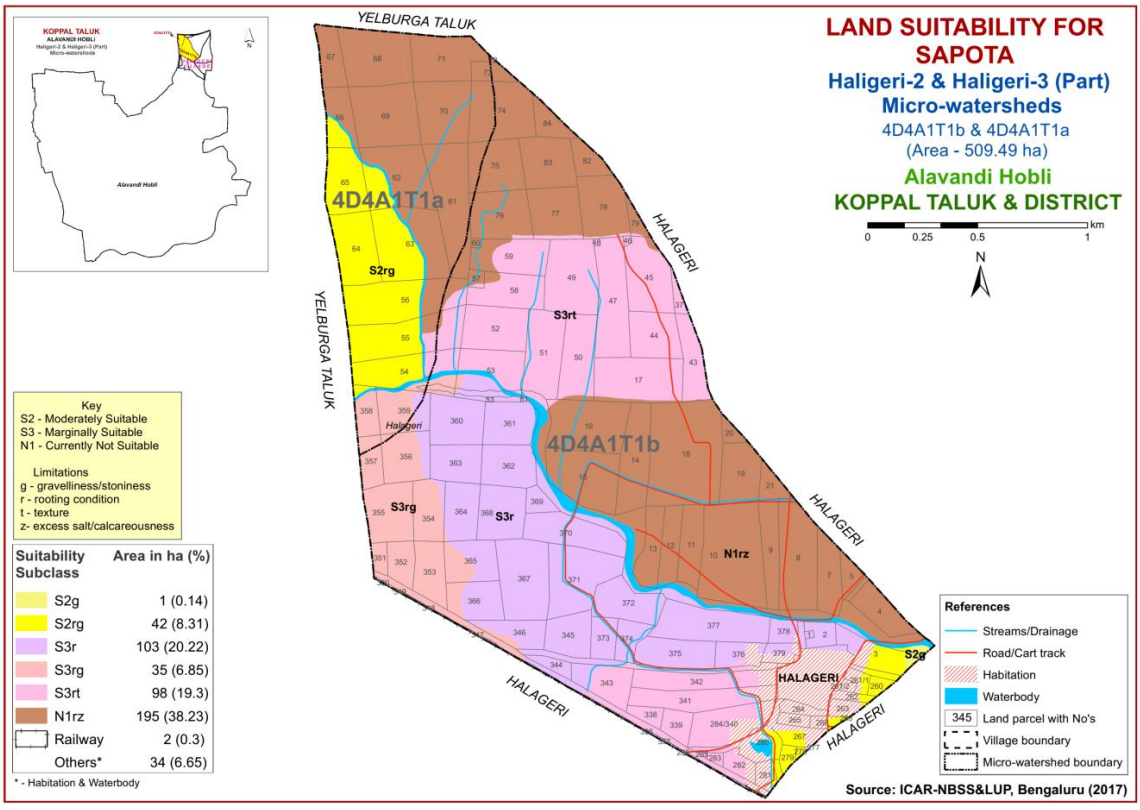


Fig. 7.14 Land Suitability map of Sapota

7.15 Land Suitability for Pomegranate (*Punica granatum*)

Pomegranate is one of the commercially grown fruit crop in about 18488 ha in Karnataka mainly in Bijapur, Bagalkot, Koppal, Gadag and Chitradurga districts. The crop requirements for growing pomegranate (Table 7.16) were matched with the soil-site

characteristics (Table 7.1) of the soils of the microwatersheds and a land suitability map for growing pomegranate was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.15.

Table 7.16 Crop suitability criteria for Pomegranate

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	30-34	35-38,25-29	39-40,15-24	
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	Class	Well drained	imperfectly drained		
Nutrient availability	Texture	Class	cl, scl, l, cl	c, sic, sicl	cl, s, ls	s, fragmental
Rooting conditions	pH	1:2.5	5.5-7.5	7.6-8.5	8.6-9.0	
	Soil depth	cm	>100	75-100	50-75	<50
	Gravelcontent	% vol.	nil	15-35	35-60	>60
Soil toxicity	Salinity	dS/m	Nil	<9	>9	<50
	Sodicity	%	nil			
Erosion	Slope	%	<3	3-5	5-10	

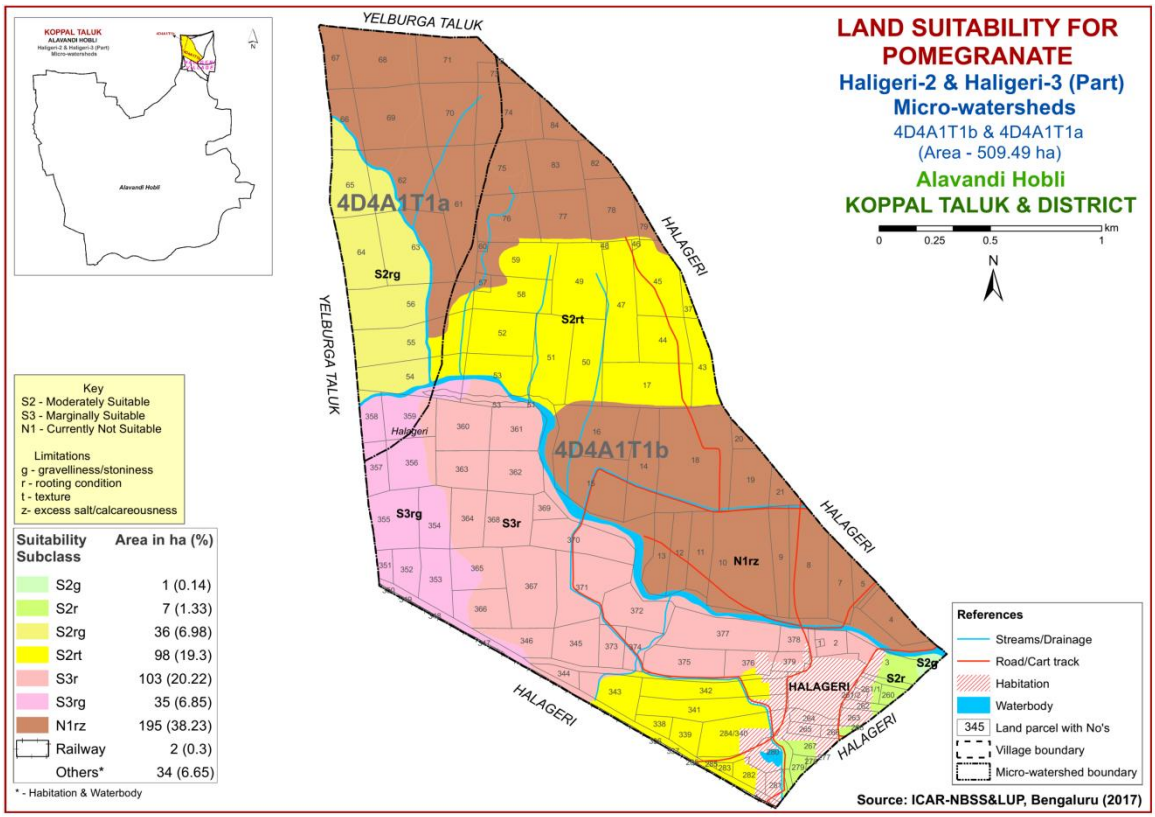


Fig. 7.15 Land Suitability map of Pomegranate

There are no highly suitable (Class S1) lands for growing pomegranatein the microwatersheds.Moderately suitable (Class S2) landsoccupy an area of 142 ha (28%)

and are distributed in the western, eastern, central, southern and southeasternpart of the microwatersheds. They have minor limitations of rooting condition, texture, and gravelliness. An area of 138 ha (27%) ismarginally suitable (Class S3) for growing pomegranate and are distributed in the western, southwestern and central part of the microwatersheds.They have moderate limitations of rooting condition and gravelliness. Anarea of 195 ha (38%) is not suitable (Class N1) for growing pomegranate and are distributed in the northern and eastern part of the microwatersheds with severe limitations of calcareousness and rooting condition.

7.16 Land suitability for Guava (*Psidium guajava*)

Guava is one of the most important fruit crop grown in an area of about 0.64 lakh ha in almost all the districts of the State. The crop requirements (Table 7.17) for growing guava were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing guava was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.16.

There are no highly suitable (Class S1) lands for growing guavain the microwatersheds. An area of 78 ha (15%) is moderately suitable (Class S2) for growing guava and are distributed in the western and southeastern part of the microwatersheds. They have minor limitations of rooting condition, texture and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 201 ha (40%) and are distributed in the major part of the microwatersheds. They have moderate limitations oftexture and rooting condition. An area of about 195 ha (38%) is not suitable (Class N1) for growing guava and occur in the northern and eastern part of the microwatersheds with severe limitationsof rooting condition and texture.

Table 7.17 Crop suitability criteria for Guava

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable (S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	28-32	33-36,24-27	37-42,20-23	
Soil moisture	Growing period	Days	>150	120-150	90-120	<90
Soil aeration	Soil drainage	Class	Well drained	Mod. to imperfectly	poor	Very poor
Nutrient availability	Texture	Class	scl, l, cl, sil	sl,sicl,sic.,sc,c	c (<60%)	c (>60%)
	pH	1:2.5	6.0-7.5	7.6-8.0:5.0-5.9	8.1-8.5:4.5-4.9	>8.5:<4.5
	$CaCO_3$ in root zone	%	Non calcareous	<10	10-15	>15
Rooting conditions	Soil depth	cm	>100	75-100	50-75	<50
	Gravelcontent	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	dS/m	<2.0	2.0-4.0	4.0-6.0	
	Sodicity	%	Non sodic	10-15	15-25	>25
Erosion	Slope	%	<3	3-5	5-10	>10

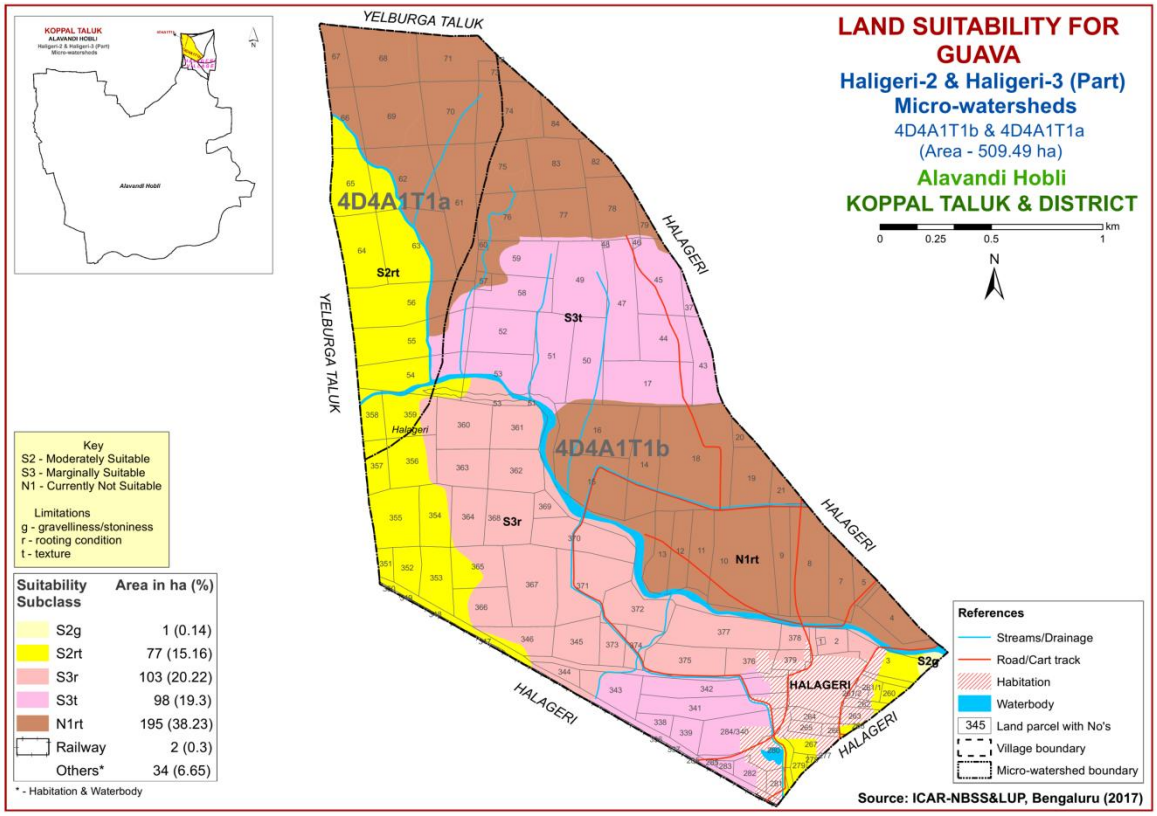


Fig. 7.16 Land Suitability map of Guava

7.17Land Suitability for Jackfruit (*Artocarpus heterophyllus*)

Jackfruit is one of the most important fruit crop grown in 5368 ha in all the districts of the State. The crop requirements for growing jackfruit (Table 7.18) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jackfruit was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in figure 7.17.

There are no highly suitable (Class S1) lands for growing jackfruitin the microwatersheds. An area of 78 ha (15%) is moderately suitable (Class S2) and are distributed in thewestern and northeastern part of the microwatersheds with minor limitations of rooting condition and gravelliness. Marginally suitable (Class S3) lands cover a maximum area of 201 ha (40%) and are distributed in the majorpart of the microwatersheds. They have moderate limitations of rooting condition and texture. An area of 195 ha (38%)is not suitable (Class N1) for growing jackfruit and occur in the northernand easternpart of the microwatersheds with severe limitations of texture and rooting condition.

Table 7.18 Crop suitability criteria for Jackfruit

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	class	well	Mod. well	Poorly	V. Poorly
Nutrient availability	Texture	Class	scl, cl, sc, c (red)	-	sl, ls, c (black)	-
	pH	1:2.5	5.5-7.3	5.0-5.5,7.3-7.8	7.8-8.4	>8.4
Rooting conditions	Soildepth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	>5	-

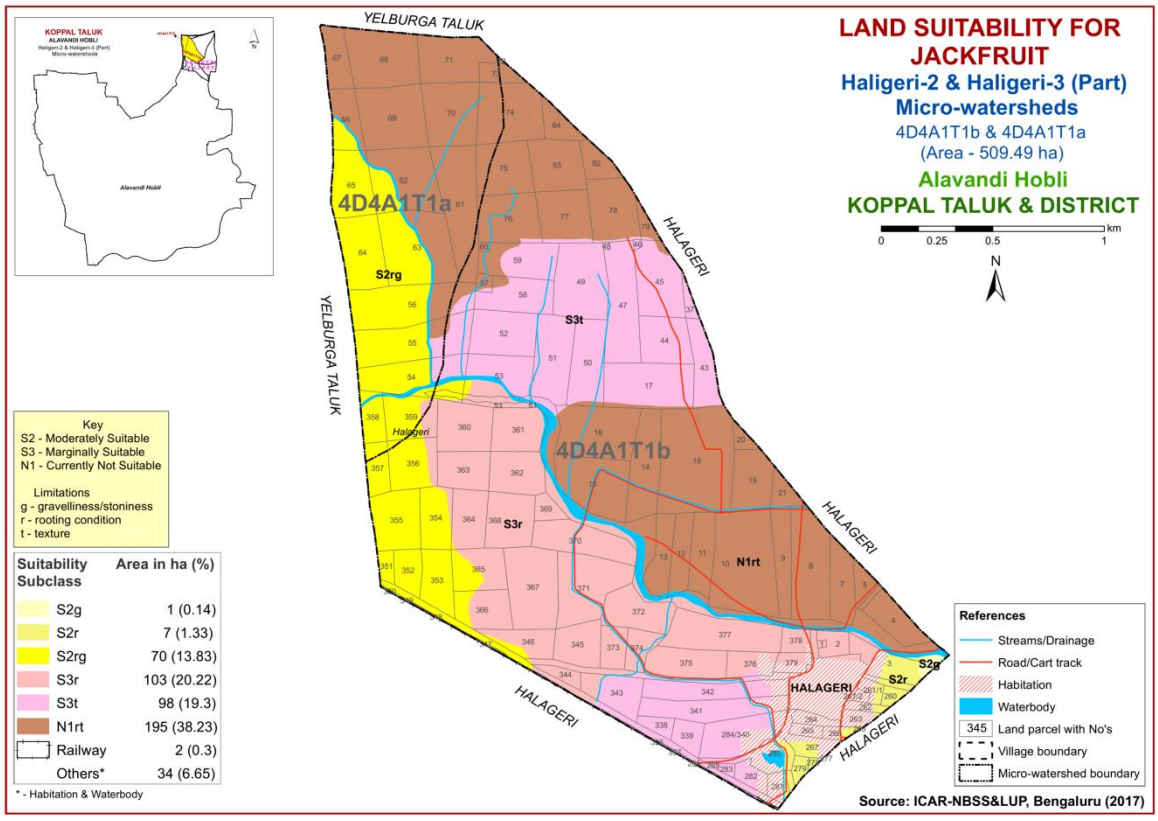


Fig. 7.17 Land Suitability map of Jackfruit

7.18Land Suitability for Jamun (*Syzygium cumini*)

Jamun is an important fruit crop grown in almost all the districts of the State. The crop requirements for growing jamun (Table 7.19) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jamun was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.18.

There are no highly suitable (Class S1) landsfor growing jamunin the microwatersheds. An area of 78 ha (15%) is moderately suitable (Class S2) and occur in thewestern and southeasternpart of the microwatersheds. They have minor limitations of

rooting conditionand gravelliness. Marginally suitable (Class S3) cover an area of 201 ha (40%) and are distributed in the majorpart of the microwatersheds with moderate limitations of rooting conditionand texture. An area of 195 ha (38%) is not suitable (Class N1) for growing jamun and are distributed in the northern and easternpart of the microwatersheds with severe limitations of texture and rooting condition.

Table 7.19 Crop suitability criteria for Jamun

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well	Mod. well	Poorly	V.Poorly
Nutrient availability	Texture	Class	scl,cl,sc,c(red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.8	5.0-6.0	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-5	5-10	>10

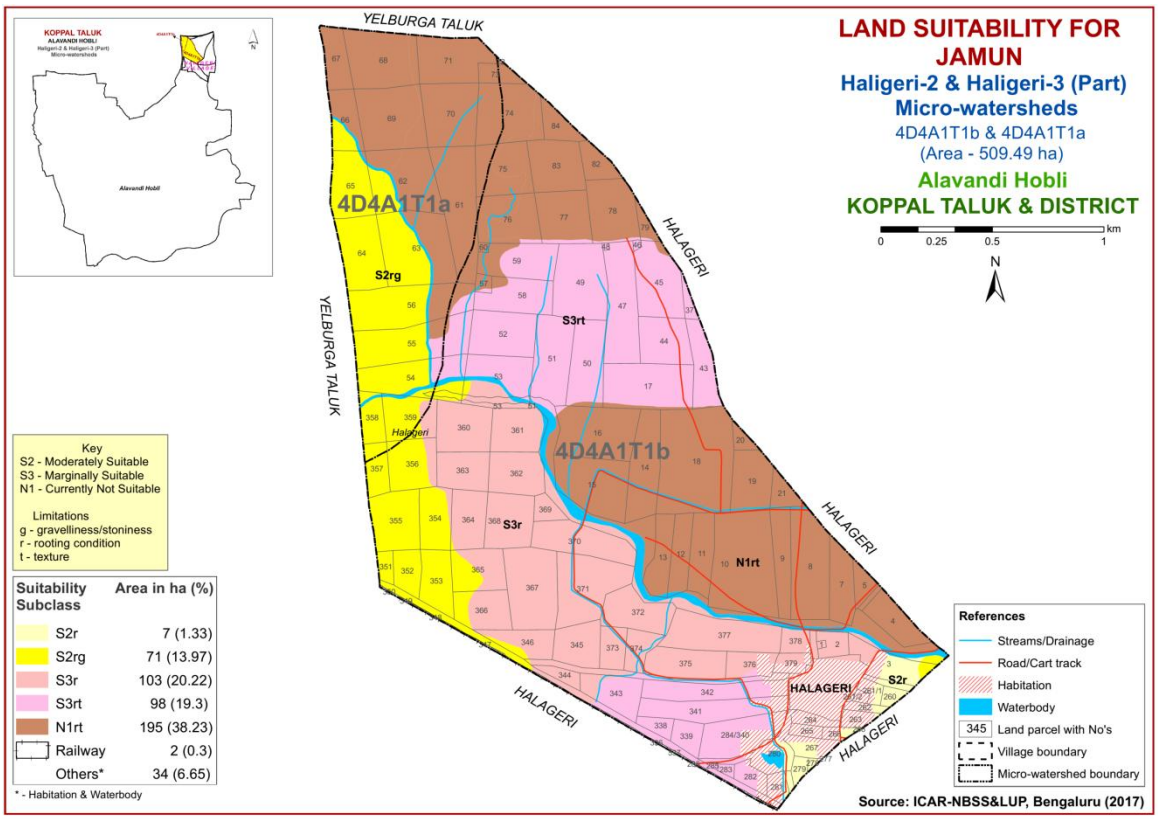


Fig. 7.18Land Suitability map of Jamun

7.19Land Suitability for Musambi (*Citrus limetta*)

Musambi is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing musambi (Table 7.20) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing musambi

was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.19.

There are no highly suitable (Class S1) lands for growing musambiin the microwatersheds. An area of 141ha (28%) is moderately suitable (Class S2) for growing musambi and are distributed in the western, central, eastern, southernand southeastern part of the microwatersheds. They have minor limitations of rooting conditionand gravelliness.Marginally suitable (Class S3)lands occur in an area of 138 ha (27%) for growing musambi and are distributed in the southwestern, central and southern part of the microwatershedswith moderate limitations of rooting condition andgravelliness. Anarea of 195 ha (38%) is not suitable (Class N1) for growing musambi and are distributed in the northern and eastern part of the microwatersheds. They have severe limitations of calcareousness and rooting condition.

Table 7.20 Crop suitability criteria for Musambi

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	28-30	31-35,24-27	36-40,20-23	>40,<20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imp.drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl,cl,s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.4,7.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

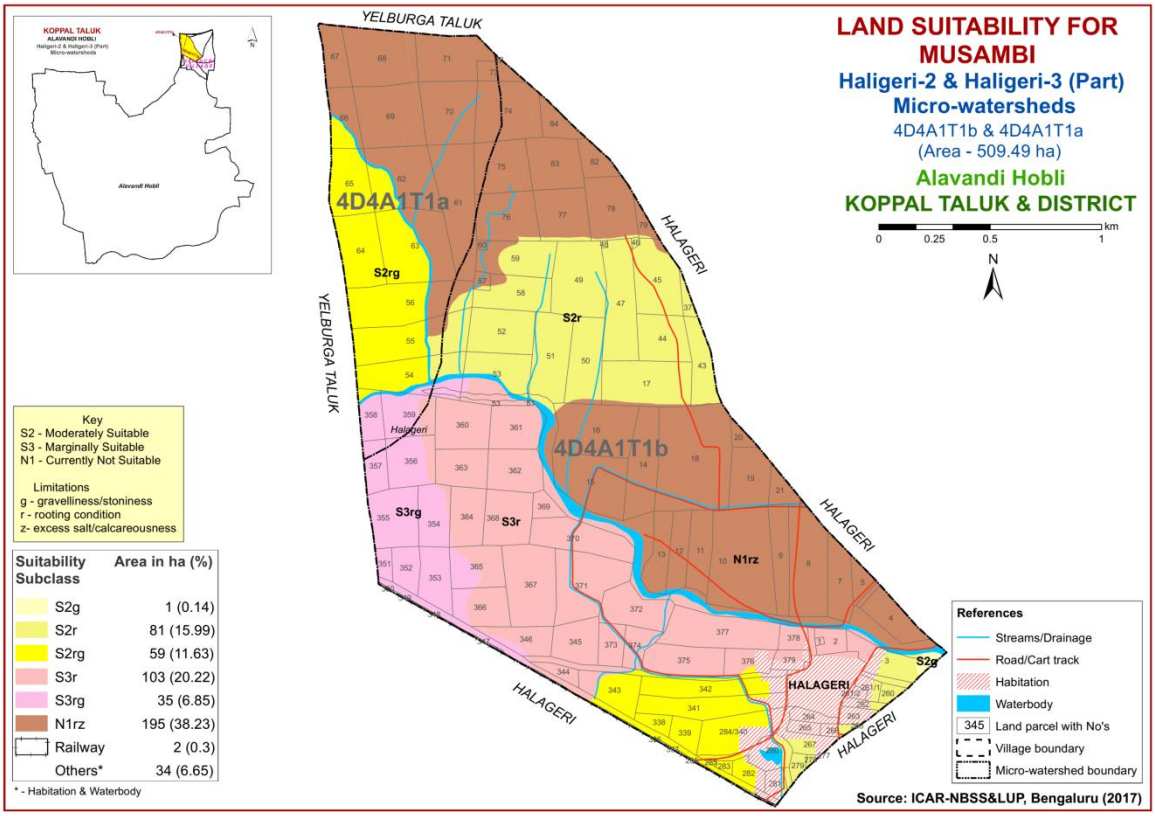


Fig. 7.19Land Suitability map of Musambi

7.20 Land Suitability for Lime (*Citrus sp*)

Lime is one of the most important fruit crop grown in an area of 0.11 lakh ha in almost all the districts of the State. The crop requirements for growing lime(Table 7.21) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing lime was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.20.

There are no highly suitable (Class S1) lands for growing limein the microwatersheds.An area of 176 ha (35%) is moderately suitable (Class S2) and are distributed in the western, central, eastern, southernand southeastern part of the microwatersheds. They have minor limitations of rooting conditionand gravelliness. Marginally suitable (Class S3) lands occur in an area of 103 ha (20%) for growing lime and distributed in the central and southern part of the microwatershedswith moderate limitation of rooting condition.An area of 195 ha (38%) is not suitable (Class N1) for growing lime and are distributed in the northern and easternpart of the microwatershedswith severe limitations of calcareousness and rooting condition.

Table 7.21Crop suitability criteria for Lime

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season	^{0}C	28-30	31-35,24-27	36-40,20-23	>40,<20
Soil moisture	Growing period	Days	240-265	180-240	150-180	<150
Soil aeration	Soil drainage	Class	Well drained	Mod. to imp.drained	Poorly	Very poorly
Nutrient availability	Texture	Class	scl,l,sicl, cl,s	sc, sc, c	c(>70%)	s, ls
	pH	1:2.5	6.0-7.5	5.5-6.47.6-8.0	4.0-5.4,8.1-8.5	<4.0,>8.5
	$CaCO_3$ in root zone	%	Non calcareous	Upto 5	5-10	>10
Rooting conditions	Soil depth	cm	>150	100-150	50-100	<50
	Gravel content	% vol.	Non gravelly	15-35	35-55	>55
Soil toxicity	Salinity	dS/m	Non saline	Upto 1.0	1.0-2.5	>2.5
	Sodicity	%	Non sodic	5-10	10-15	>15
Erosion	Slope	%	<3	3-5	5-10	

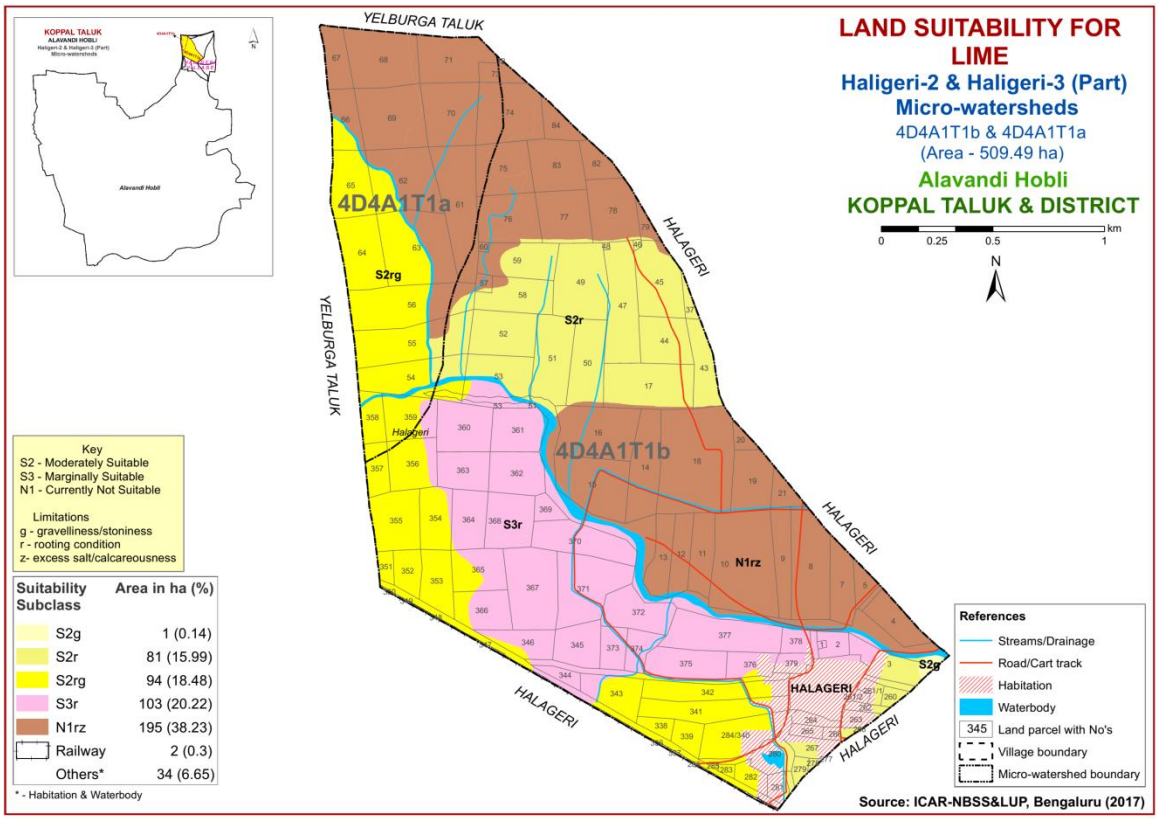


Fig. 7.20 Land Suitability map of Lime

7.21 Land Suitability for Cashew (*Anacardium occidentale)*

Cashew is one of the most important nut crop grown in an area of 1.24 lakh ha in almost all the districts of the State. The crop requirements for growing cashew (Table 7.22) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing cashew was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.21.

Table 7.22 Crop suitability criteria for Cashew

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V.Poorly drainage
Nutrient availability	Texture	Class				
	pH	1:2.5	5.5-6.5	5.0-5.5,6.5-7.3	7.3-7.8	>7.8
Rooting conditions	Soildepth	cm	>100	75-100	50-75	<50
	Gravel content	% vol.	<15	15-35	35-60	>60
Erosion	Slope	%	0-3	3-10	>10	

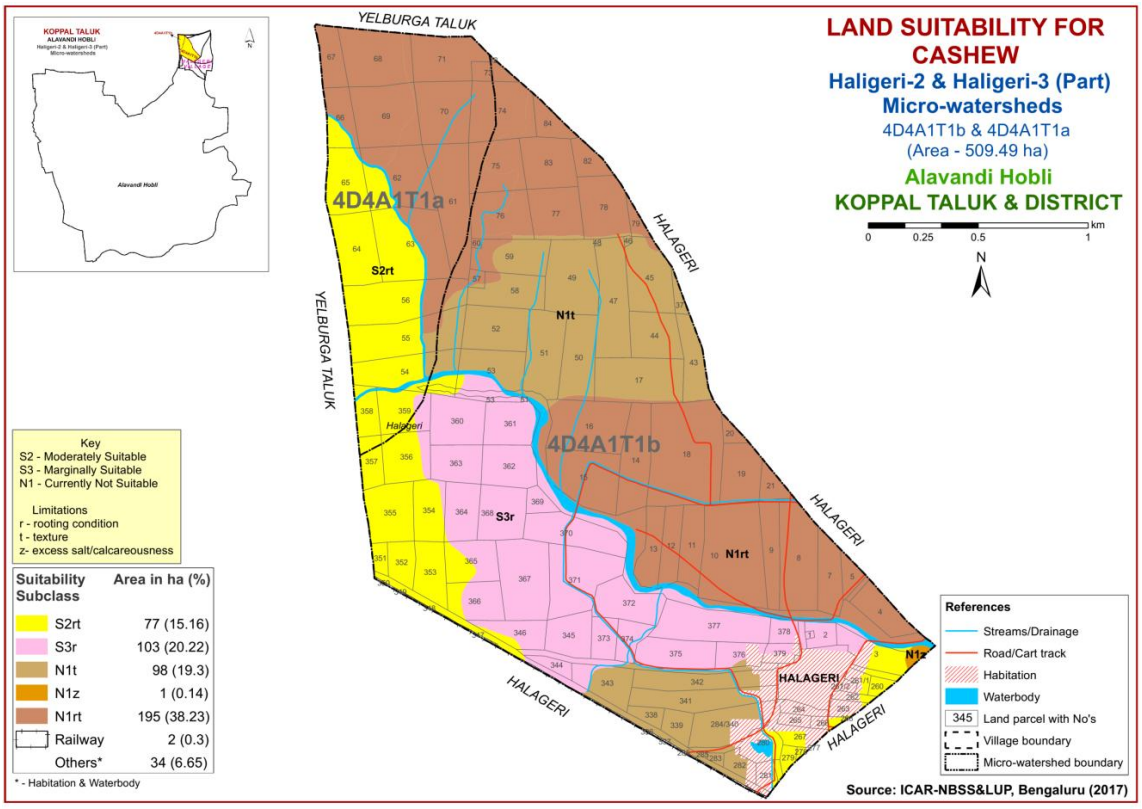


Fig. 7.21 Land Suitability map of Cashew

There are no highly suitable (Class S1) lands for growing cashewin the microwatersheds. An area of 77 ha (15%) is moderately suitable (Class S2) and occur in the western, southern and southeastern part of the microwatersheds. They have minor limitations of rooting condition and texture. Marginally suitable (Class S3) lands occur in

an area of 103 ha (20%) for growing cashew and are distributed in the central and southern part of the microwatersheds with moderate limitation of rooting condition. A maximum area of about 294 ha (58%) is not suitable (Class N1) for growing cashew with severe limitations of texture, rooting condition and calcareousness. They are distributed in the major part of the microwatersheds.

7.22 Land Suitability for Custard Apple (*Annona reticulata*)

Custard apple is one of the most important fruit crop grown in almost all the districts of the State. The crop requirements for growing custard apple(Table 7.23) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing custard apple was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.22.

An area of 141 ha (28%) is highly suitable (Class S1) for growing custard apple and are distributed in the western, southern, central and eastern part of the microwatersheds. An area of 138 ha (27%) is moderately suitable (Class S2) and are distributed in the western, southwestern, central and southern partof the microwatersheds. They have minor limitations of gravelliness and rooting condition. An area of 195 ha (38%) is marginally suitable (Class S3) for growing custard apple and are distributed in the northern and easternpart of the microwatersheds with moderate limitations of gravelliness and calcareousness.

Table 7.23Land suitability criteria for Custard apple

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately Suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Soil aeration	Soil drainage	Class	Well drained	Mod. well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	scl,cl,sc,c(red), c(black)	-	sl, ls	-
	pH	1:2.5	6.0-7.3	7.3-8.4	5.0-5.5,8.4-9.0	>9.0
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15-35	35-60	60-80	-
Erosion	Slope	%	0-3	3-5	>5	-

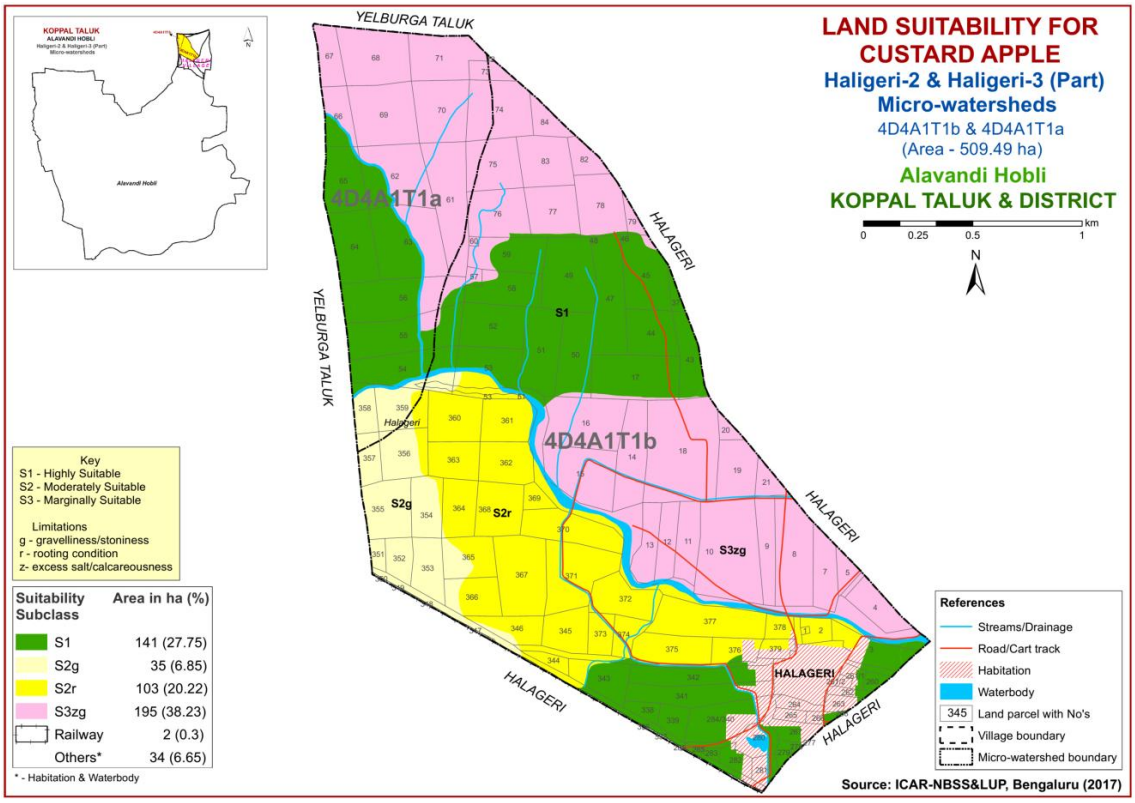


Fig. 7.22 Land Suitability map of Custard Apple

7.23 Land Suitability for Amla (*Phyllanthus emblica*)

Amla is one of the most important fruit and medicinal crop grown in 151 ha area and distributed in almost all the districts of the State. The crop requirements for growing amla (Table 7.24) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing amla was generated.The area extent and their geographic distribution of different suitability subclasses in the microwatersheds are given in Figure 7.23.

Table 7.24 Crop suitability criteria for Amla

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately Suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V. Poorly drained
Nutrient availability	Texture	Class	ccl, cl, sc, c (red)	c (black)	ls, sl	-
	pH	1:2.5	5.5-7.3	5.0-5.5	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15-35	35-60	60-80	
Erosion	Slope	%	0-3	3-5	5-10	>10

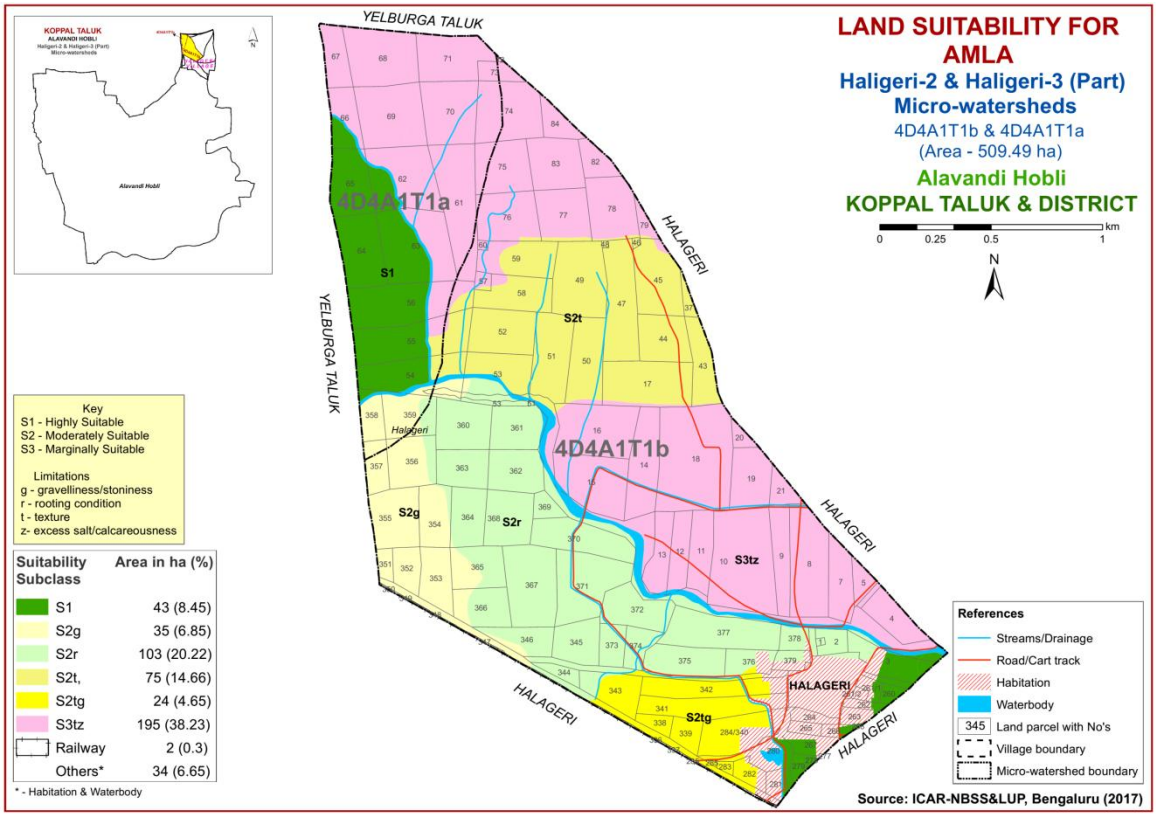


Fig. 7.23Land Suitability map of Amla

Highly suitable (Class S1) lands occupy an area of 43 ha (8%) for growing amla and are distributed in the western, southern and southeastern part of the microwatersheds. A maximum area of 237 ha (46%) has soils that are moderately suitable (Class S2) and are distributed in the major part of the microwatersheds. They have minor limitations of rooting condition, gravellinessandtexture. The marginally suitable (Class S3) landscover anarea of 195ha (38%) and occur in the northern and easternpart of the microwatersheds with moderate limitations of texture and calcareousness.

7.24 Land Suitability for Tamarind (*Tamarindus indica*)

Tamarind is one of the most important spice crop grown in 14897 ha in all the districts of the State. The crop requirements for growing tamarind (Table 7.25) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing tamarind was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.24.

There are no highly suitable (Class S1) lands for growing tamarindin the microwatersheds.A minor area of 1 ha (<1%) is moderately suitable (Class S2) and occur in the southeasternpart of the microwatersheds. They have minor limitations of rooting conditionand gravelliness. An area of 176 ha (34%) is marginally suitable (Class S3) and occur in the western, southern, central and easternpart of the microwatersheds. They have moderate limitations of rooting conditionandgravelliness. Anarea of 298 ha (58%) is not suitable (Class N1) for growing tamarind and are distributed in the central, southern,

northern and easternpart of the microwatersheds with severe limitations of calcareousness androoting condition.

Table 7.25 Crop suitability criteria for Tamarind

Crop requirement			Rating			
Soil –site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Soil aeration	Soil drainage	Class	Well drained	Mod.well drained	Poorly drained	V.Poorly drained
Nutrient availability	Texture	Class	scl, cl,sc, c (red)	sl, c (black)	ls	-
	pH	1:2.5	6.0-7.3	5.0-6.0,7.3-7.8	7.8-8.4	>8.4
Rooting conditions	Soil depth	cm	>150	100-150	75-100	<50
	Gravel content	% vol.	<15	15-35	35-60	60-80
Erosion	Slope	%	0-3	3-5	5-10	>10

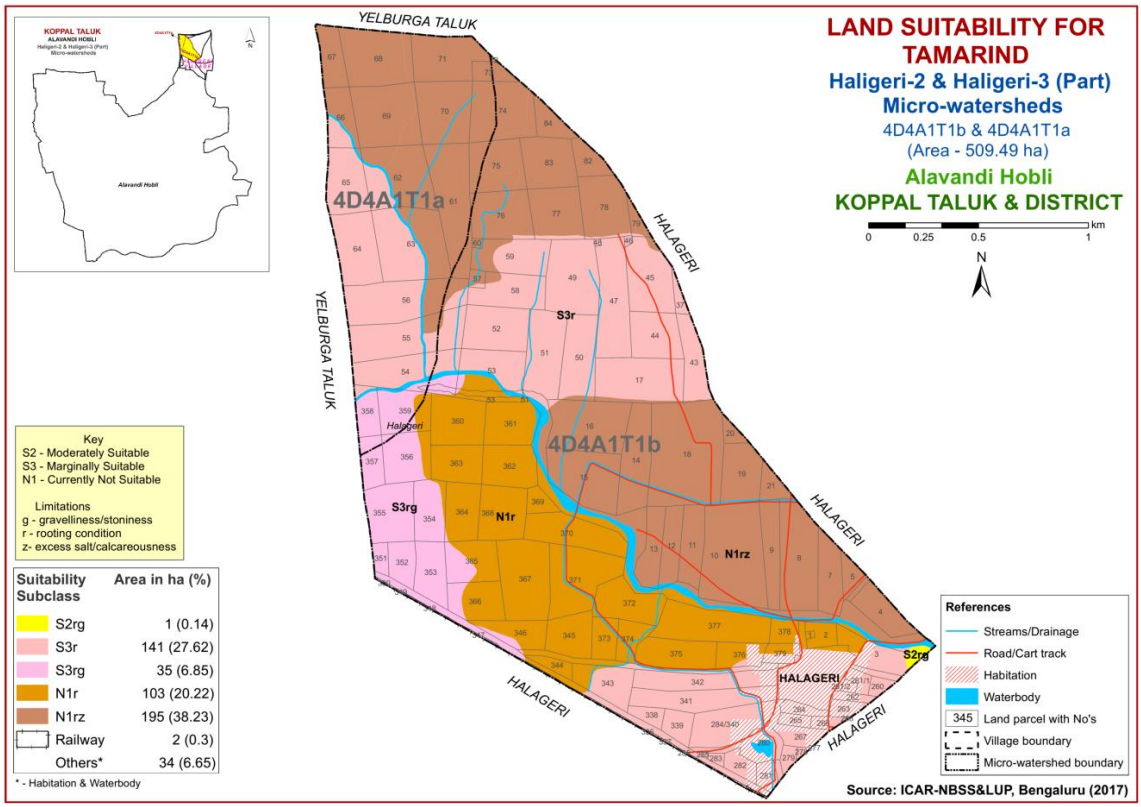


Fig. 7.24Land Suitability map of Tamarind

7.25 Land Suitability for Marigold (*Tagetes erecta*)

Marigold is one of the most important flower crop grown in an area of 1858 ha in almost all the districts of the State. The crop requirements for growing marigold (Table 7.26) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing marigold was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatershedsis given in Figure 7.25.

There are no highly suitable (Class S1) lands for growing marigoldin the microwatersheds. Major area of 245 ha (48%) is moderately suitable (Class S2) for growing marigold and are distributed in the western, southern, central and eastern part of the microwatersheds. They have minor limitations of rooting condition,texture, gravelliness and drainage. An area of 230 ha (45%) is marginally suitable (Class S3) for growing marigold and occur in the northern, eastern and westernpart of the microwatersheds. They have moderate limitations of gravelliness, calcareousness and rooting condition.

Table 7.26 Crop suitability criteria for Marigold

Crop requirement			Rating			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season		18-23	17-15,24-35	35-40,10-14	>40,<10
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l ,sl,scl,cl,sil	sicl,sc,sic,c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	-
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	-
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	-
Soil toxicity	Salinity	ds/m	Non saline	Slightly	Strongly	-
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	-

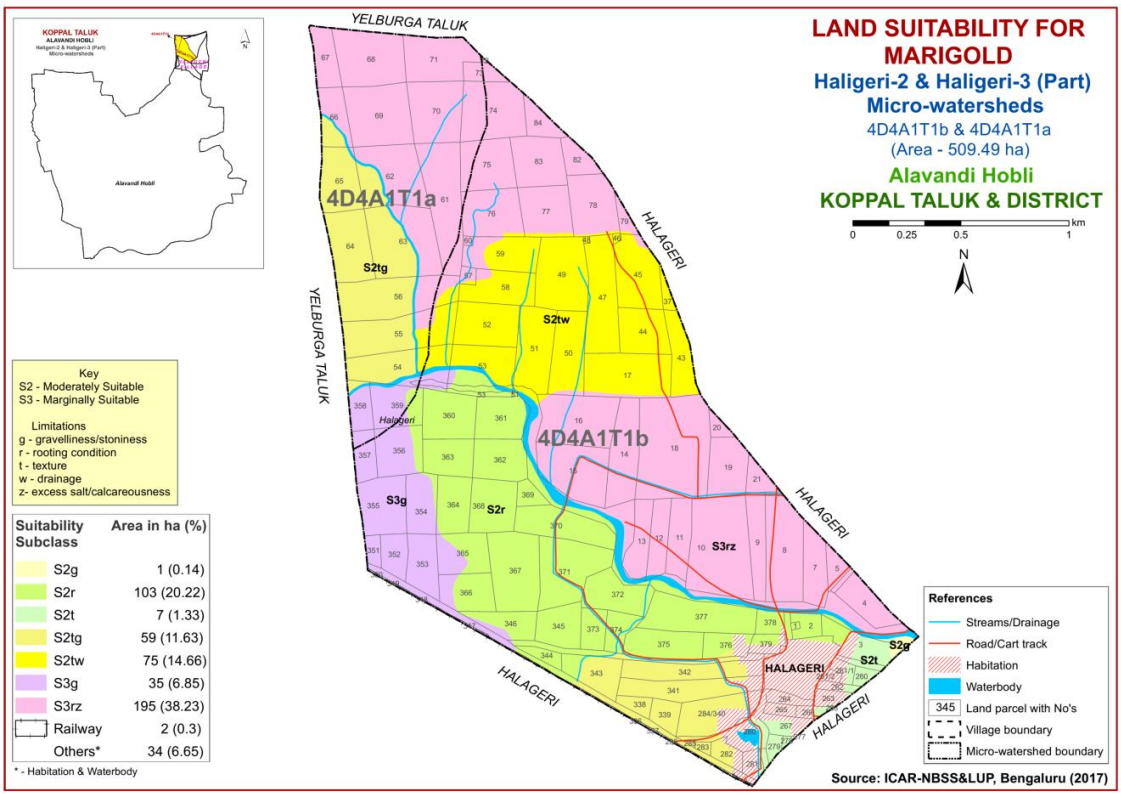


Fig. 7.25 Land Suitability map of Marigold

7.26Land Suitability for Chrysanthemum (*Chrysanthemum indicum*)

Chrysanthemum is one of the most important flower crop grown in an area of 4978 ha in almost all the districts of the State. The crop requirements for growing chrysanthemum (Table 7.27) were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing chrysanthemum was generated. The area extent and their geographic distribution of different suitability subclasses in the microwatershedsis given in Figure 7.26.

There are no highly suitable (Class S1) lands for growing chrysanthemumin the microwatersheds. Majorarea of 245 ha (48%) is moderately suitable (Class S2) for growing chrysanthemum and are distributed in the western, southern, central and easternpart of the microwatersheds. They have minor limitations of rooting condition, gravelliness, drainage and texture. Anarea of 230 ha (45%)is marginally suitable (Class S3) for growing chrysanthemum and occur in the northern, western and easternpart of the microwatersheds. They have moderate limitations of gravelliness, rooting condition and calcareousness.

Table 7.27Crop suitability criteria for Chrysanthemum

Crop requirement			**Rating**			
Soil –site characteristics		**Unit**	**Highly suitable(S1)**	**Moderately suitable(S2)**	**Marginally suitable(S3)**	**Not suitable(N)**
Climate	Temperature in growing season	^{0}C	18-23	17-15,24-35	35-40,10-14	>40,<10
Soil aeration	Soil drainage	Class	Well drained	Moderately well drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	l ,sl, scl, cl, sil	sicl, sc, sic, c	c	ls, s
	pH	1:2.5	7.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strongly calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	slightly	strongly	
	Sodicity (ESP)	%	<10	10-15	>15	-
Erosion	Slope	%	1-3	3-5	5-10	

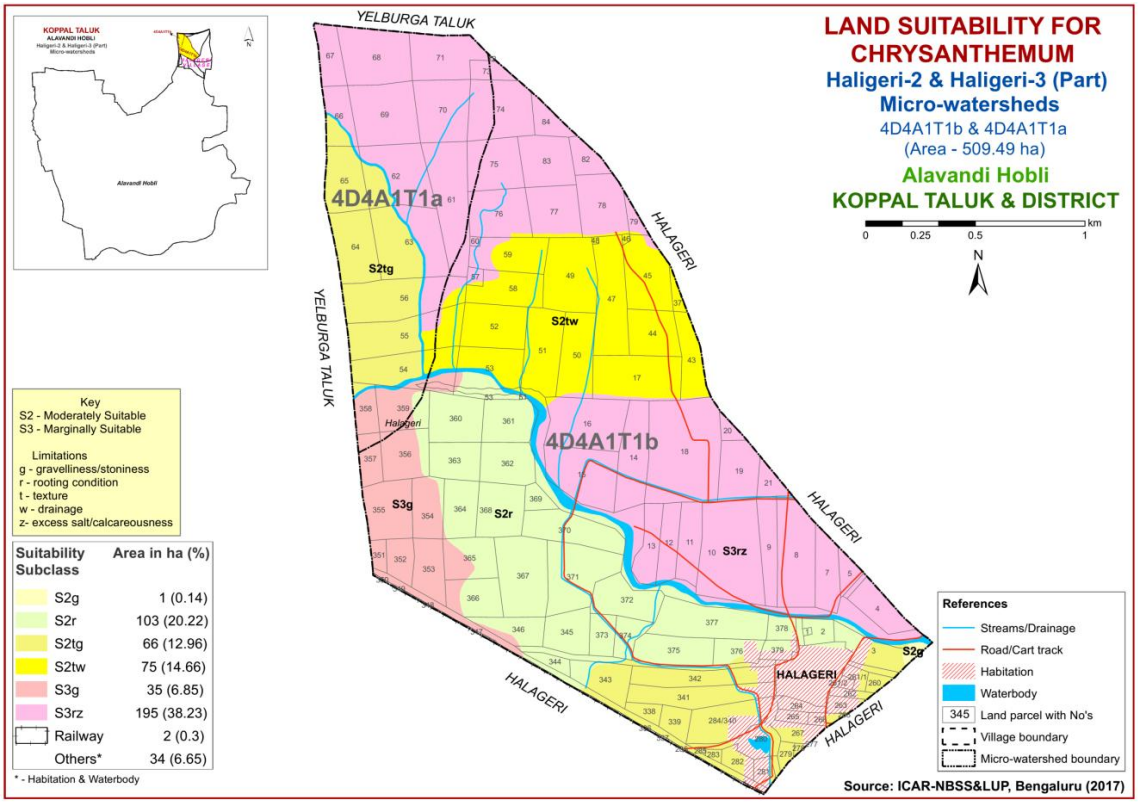


Fig. 7.26 Land Suitability map of Chrysanthemum

7. 27Land Suitability for Jasmine *(Jasminum sp.)*

Jasmine is one of the most important flower crop grown in an area of 6146 ha in almost all the districts of the State. The crop requirements (Table 7.28) for growing jasmine were matched with the soil-site characteristics (Table 7.1) and a land suitability map for growing jasmine was generated. The area extent and their geographical distribution of different suitability subclasses in the microwatersheds are given in Figure 7.27.

There are no highly suitable (Class S1) lands for growing jasmine in the microwatersheds. An area of 146 ha (29%) is moderately suitable (Class S2) for growing jasmine and are distributed in the western, southern, central and southeastern part of the microwatersheds. They have minor limitations of rooting condition, texture and gravelliness. Major area of 329 ha (64%) is marginally suitable (Class S3) for growing jasmine and are distributed in the major part of the microwatersheds. They have moderate limitations of gravelliness, rooting condition, texture, drainage and calcareousness.

Table 7.28 Crop suitability criteria for jasmine (irrigated)

Crop requirement			Rating			
Soil-site characteristics		Unit	Highly suitable(S1)	Moderately suitable(S2)	Marginally suitable(S3)	Not suitable(N)
Climate	Temperature in growing season		18-23	17-15,24-35	35-40,10-14	
Soil aeration	Soil drainage	Class	Well drained	Moderately drained	Imperfectly drained	Poorly drained
Nutrient availability	Texture	Class	scl, l, scl, cl, sil	sicl, sc, sic, c (m/k)	c (ss),	ls, s
	pH	1:2.5	6.0-7.5	5.5-5.9,7.6-8.5	<5,>8.5	
	$CaCO_3$ in root zone	%	Non calcareous	Slightly calcareous	Strong calcareous	
Rooting conditions	Soil depth	cm	>75	50-75	25-50	<25
	Gravel content	% vol.	<15	15-35	>35	
Soil toxicity	Salinity	ds/m	Non saline	Slight	Strongly	
	Sodicity	%	Non sodic	Slight	Strongly	
Erosion	Slope	%	1-3	3-5	5-10	

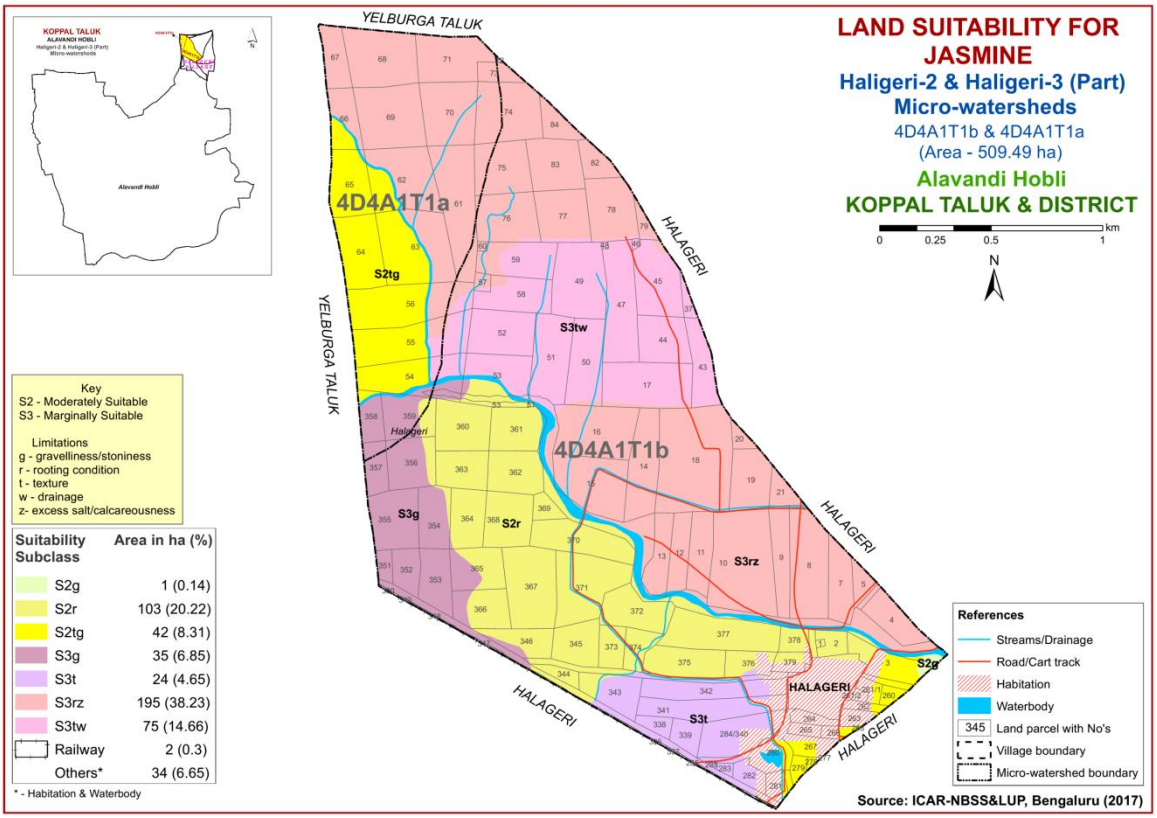


Fig. 7.27 Land Suitability map of Jasmine

7. 28 Land Suitability for Crossandra*(Crossandra in fundibuliformis)*

Crossandra is one of the most important flower crop grown in almost all the districts of the State. The area extent and their geographical distribution of different suitability subclasses in the microwatersheds are given in Figure 7.28.

There are no highly suitable (Class S1) for growing crossandra in the microwatersheds. An area of 146 ha (29%) is moderately suitable (Class S2) for growing jasmine and are distributed in the western, southern, central and southeastern part of the microwatersheds. They have minor limitations of rooting condition, texture and gravelliness. Major area of 329ha (64%) is marginally suitable (Class S3) for growing jasmine and are distributed in all parts of the microwatersheds. They have moderate limitations of gravelliness, rooting condition, texture, drainage and calcareousness.

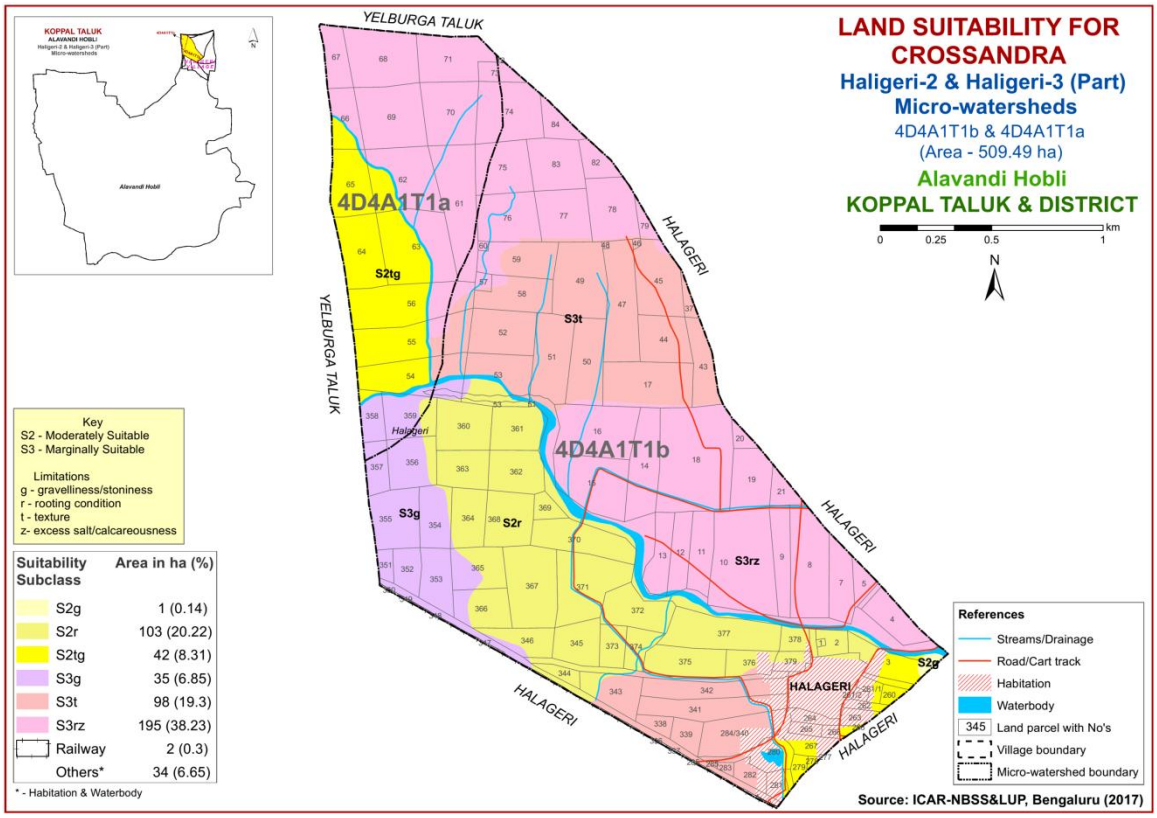


Fig. 7.28 Land Suitability map of Crossandra

7.29 Land Management Units (LMU)

The 9 soil map units identified in Haligeri-2 & Haligeri-3 microwatersheds have been grouped into 4 Land Management Units (LMU) for the purpose of preparing a Proposed Crop Plan. Land Management Units are grouped based on the similarities in respect of the type of soil, the depth of the soil, the surface soil texture, gravel content, AWC, slope, erosion etc. and a Land Management Units (Fig.7.29) has been generated. These Land Management Units are expected to behave similarly for a given level of management.

The map units that have been grouped into four Land Management Units along with brief description of soil and site characteristics are given below.

LMU No.	Soil map unit number	Mapping unit	Soil and site characteristics
1	357, 362	NSPiB1g1, NSPmB2	Moderately deep, black clay soils
2	165, 166, 177, 177, 207	BSRiB1g1, BSRiB1g2, CKMiA1, MNLiB1g1	Moderately deep to deep, red sandy clay to sandy clay loam soils
3	59	TDHhB2g2	Moderately shallow, red sandy clay to clay soils
4	310, 311	MTLmB2, MTLmB2g1	Shallow, calcareous black gravelly sandy clay to clay soils

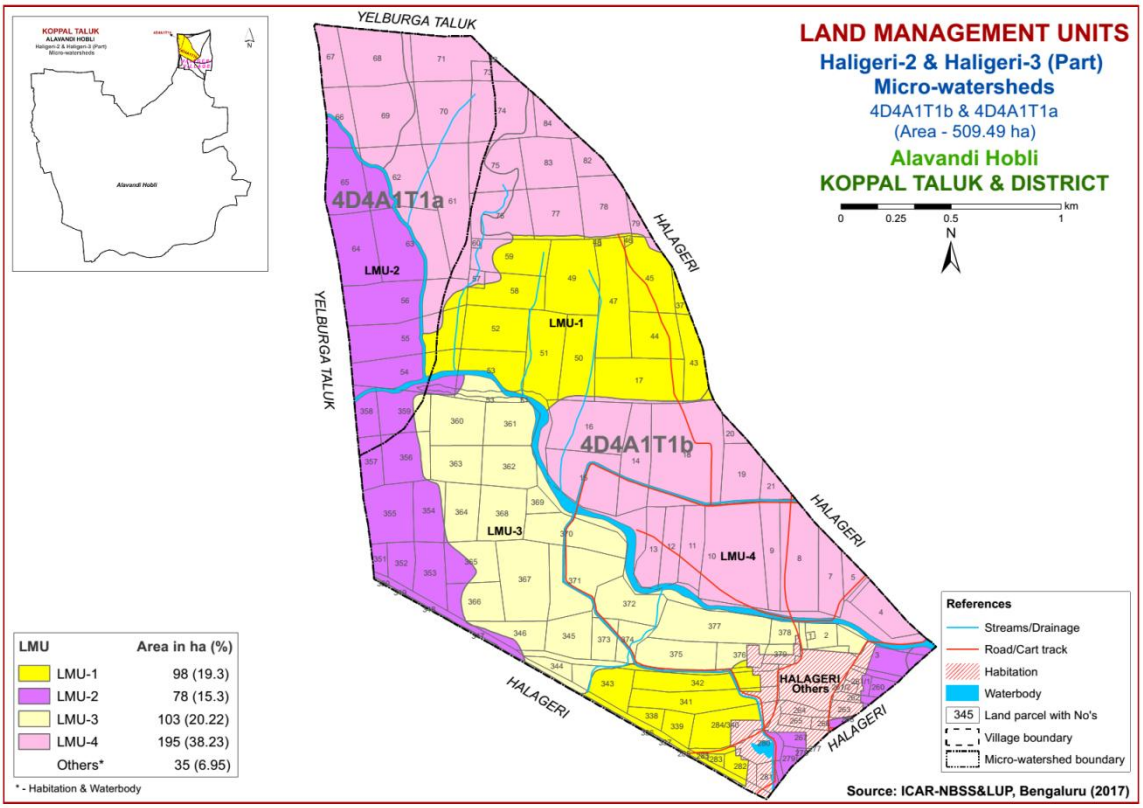


Fig 7.29 Land Use Classes map of Haligeri-2 & Haligeri-3 microwatersheds

7.29 Proposed Crop Plan for Haligeri-2 & Haligeri-3 Microwatersheds

After assessing the land suitability for the 28 crops, the proposed crop plan has been prepared for the 4 identified LUCs by considering only the highly (Class S1) and moderately (Class S2) suitable lands for each of the 28 crops. The resultant proposed crop plan is presented in Table 7.29.

Table 7.29Proposed Crop Plan for Haligeri-2 & Haligeri-3 Microwatersheds

Proposed Land Use Class	Soil Map Units	Survey Number	Soil characters	Field Crops	Horticulture Crops	Suitable Interventions
LUC 1 98 ha (19%)	357.NSPiB1g1 362.NSPmB2	**Halageri :** 17,37,43,44,45,46,47,48, 49,50, 51,52,53,58,59, 282,283,284/340,285, 338,339,341,342,343	Moderately deep, black clay soils	Sorghum, Sunflower, Cotton, Bengal gram, Safflower, Linseed, Bajra	**Fruit crops:** Pomegranate, Lime, Musambi, Jamun, Tamarind, Amla, Custard apple **Vegetables:** Drumstick, Chilli, Coriander **Flowers:**Marigold, Chrysanthemum	Application of FYM, Biofertilizers and micronutrients, drip irrigation, mulching, suitable soil and water conservation practices
LUC 2 78 ha (15%)	165. BSRiB1g1 166. BSRiB1g2 177. CKMiA1 207. MNLiB1g1	**Halageri :** 3,54,55,56,63,64,65,260, 268,278,279, 351,352,353, 354,355,356,357,358,359	Moderately deep to deep, red sandy clay to sandy clay loam soils	Maize, Sorghum, Bajra, Groundnut, Redgram, Castor	**Fruit crops:** Guava, Pomegranate, Musambi, Lime, Jamun, Tamarind**,** Jackfruit Amla,Custard apple **Vegetables:** Drumstick, Tomato, Chilli **Flowers:** Marigold, Chrysanthemum, Jasmine	Drip irrigation, mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LUC 3 103 ha (20%)	59. TDHhB2g2	**Halageri :** 1,2,344,345,346,360,361, 362,363,364,365,366,367,368,369,370,371,372,373,374,375,376,377,378	Moderately shallow, red sandy clay to clay soils	Groundnut, Bajra, Horsegram, Castor	**Fruit crops:** Amla, Custard apple, Lime, Musambi **Flowers:** Marigold, Chrysanthemum	Drip irrigation, Mulching, suitable soil and water conservation practices (Crescent Bunding with Catch Pit etc)
LUC 4 195 ha (38%)	310.MTLmB2 311.MTLmB2g1	**Halageri :** 4,5,7,8,9,10,11,12,13,14, 15,16,18,19,20,21, 57,60,61,62,66,67,68,69, 70,71,72,73,74,75,76,77, 78,79, 82,83,84,	Shallow, calcareous black gravelly sandy clay to clay soils	Bengal gram, Horsegram, Coriander	**Agri-Silvi-Pasture:** Hybrid Napier, *Styloxanthes hamata, Styloxanthes scabra*	Sowing across the slope, drip irrigation and mulching is recommended

Chapter 8

SOIL HEALTH MANAGEMENT

8.1 Soil Health

Soil health is basic to plant health and plant health is basic to human and bovine health. Soil is fundamental to crop production. Without soil, no food could be produced nor would livestock be fed on a large scale. Because it is finite and fragile, soil is a precious resource that requires special care from its users.

Soil health or the capacity of the soil to function is critical to human survival. Soil health has been defined as: "the capacity of the soil to function as a living system without adverse effect on the ecosystem". Healthy soils maintain a diverse community of soil organisms that help to form beneficial symbiotic associations with plant roots, recycle essential plant nutrients, improve soil structure with positive repercussions for soil, water and nutrient holding capacity and ultimately improve crop production and also contribute to mitigating climate change by maintaining or increasing its carbon content.

Functional interactions of soil biota with organic and inorganic components, air and water determine a soil's potential to store and release nutrients, and water to plants and to promote and sustain plant growth. Thus, maintaining soil health is vital to crop production and conserve soil resource base for sustaining agriculture.

The most important characteristics of a healthy soil are

- Good soil tilth
- Sufficient soil depth
- Good water storage and good drainage
- Adequate supply, but not excess of nutrients
- Large population of beneficial organisms
- Small proportion of plant pathogens and insect pests
- Low weed pressure
- Free of chemicals and toxins that may harm the crop
- Resistance to degradation
- Resilience when unfavourable conditions occur

Characteristics of Haligeri-2 & Haligeri-3 Microwatersheds

- The soil phases with sizeable area identified in the microwatersheds belonged to the soil series Muttal (MTL) 195 ha (38%), Thammadahalli (TDH) 103 ha (20%), Narasapura (NSP) 99 ha (19%), Bisarahalli (BSR) 71 ha (14%), Chikkamegheri (CKM) 7 ha (1%) and Mornal 1 ha (<1%) area in the microwatersheds.
- As per land capability classification, entire area in the microwatershedsfalls under arable land category (ClassII &III). The major limitations identified in the arable lands were soil and erosion.

- ❖ On the basis of soil reaction, an area of about 3 ha (<1%) is neutral (pH 6.5-7.3), 208 ha (41%) is slightly tomoderately alkaline (pH 7.3-8.4) and about 262 ha (51%) is under strongly to very stronglyalkaline (pH 8.4-9.0) in the microwatersheds. Entire area in the microwatersheds is alkaline in nature, except a small area of 3 ha.

Soil Health Management

The following actions are required to improve the current land husbandry practices that provide a sound basis for the successful adoption of sustainable crop production system.

Acid soils

1. Growing of crops suitable for a particular soil pH.
2. Ameliorating the soils through the application of amendments (liming materials).

Liming materials:

1. $CaCO_3$ (Calcium Carbonate). More than 90% use in India.
2. Dolomite [Ca Mg $(Co_3)_2$]
3. Quick lime (Cao)
4. Slaked lime [Ca $(OH)_2$]

For normal pH and pH-4.8(35 t/ha) and pH 6 .0-7.0(4 t/ha) lime is required.

Alkaline soils

(Slightly alkaline to very moderately alkaline soils)

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers (Azospirullum, Azatobacter, Rhizobium).
3. Application of 25% extra N and P (125 % RDN&P).
4. Application of $ZnSO_4$ – 12.5 kg/ha (once in three years).
5. Application of Boron – 5kg/ha (once in three years).

Neutral soils

1. Regular addition of organic manure, green manuring, green leaf manuring, crop residue incorporation and mulching needs to be taken up to improve the soil organic matter status.
2. Application of biofertilizers, (Azospirullum, Azotobacter, Rhizobium).
3. Application of 100 per cent RDF.
4. Need based micronutrient applications.

Besides the above recommendations, the best transfer of technology options are also to be adopted.

Soil Degradation

Soil erosion is one of the major factor affecting the soil health in the microwatersheds. Out of total 509 ha area in the microwatersheds, an area of about 102 ha (20%) is suffering from slight and 372 ha (73%) is suffering from moderateerosion. The areaswith moderate erosion need immediate soil and water conservation and, other land development and land husbandry practices for restoring soil health.

Dissemination of Information and Communication ofBenefits

Any large scale implementation of soil health management requires that supporting information is made available widely, particularly through channels familiar to farmers and extension workers. Given the very high priority attached to soil health especially by the Central Government on issuing Soil-Health Cards to all the farmers, media outlets like Regional, State and National Newspapers, Radio and Dooradarshan programs in local languages but also modern information and communication technologies such as Cellular phones and the Internet, which can be much more effective in reaching the younger farmers.

Inputs for Net Planning (Saturation Plan) and Interventions needed

Net planning (Saturation plan) in IWMP is focusing on preparation of

1. Soil and Water Conservation Treatment Plans for each plot or farm.
2. Productivity enhancement measures/ interventions for existing crops/livestock/other farm enterprises.
3. Diversification of farming mainly with perennial horticultural crops and livestock.
4. Improving livelihood opportunities and income generating activities.

In this connection, how various outputs of Sujala-III are of use in addressing these objectives of Net Planning are briefly presented below.

- **Soil Depth:** The depth of a soil decides the amount of moisture and nutrients it can hold, what crops can be taken up or not, depending on the rooting depth and the length of growing period available for raising any crop. Deeper the soil, better for a wide variety of crops. If sufficient depth is not available for growing deep rooted crops, either choose medium or short duration crops or deeper planting pits need to be opened and additional good quality soil brought from outside has to be filled into the planting pits.
- **Surface Soil Texture:** Lighter soil texture in the top soil means, better rain water infiltration, less run-off and soil moisture conservation, less capillary rise and less evaporation losses. Lighter surface textured soils are amenable to good soil tilth and are highly suitable for crops like groundnut, root vegetables (carrot, raddish, potato etc) but not ideal for crops that need stagnant water like lowland paddy. Heavy textured soils are poor in water infiltration and percolation. They are prone for sheet erosion; such soils can be improved by sand mulching. The technology that is developed by the AICRP-Dryland Agriculture, Vijayapura, Karnataka can be adopted.

- **Gravelliness:** More gravel content is favorable for run-off harvesting but poor in soil moisture storage and nutrient availability. It is a significant parameter that decides the kind of crop to be raised.
- **Land Capability Classification:** The land capability map shows the areas suitable and not suitable for agriculture and the major constraints in each of the plot/survey number. Hence, one can decide what kind of enterprise is possible in each of these units. In general, erosion and soil are the major constraints in Haligeri-2 & Haligeri-3 Microwatersheds.
- **Organic Carbon:** The OC content (an index of available Nitrogen) is medium (0.5-0.75%) in an area of 395 ha (77%) and low (<0.5%) in 79 ha (16%). The areas that are low and medium in OC needs to be further improved by applying farmyard manure and rotating crops with cereals and legumes or mixed cropping.
- **Promoting green manuring:** Growing of green manuringcropscosts Rs. 1250/ha (green manuring seeds) and about Rs. 2000/ha towards cultivation that totals to Rs. 3250/- per ha. On the other hand, application of organic manure @ 10 tons/ha costs Rs. 5000/ha. The practice needs to be continued for 2-3 years or more. Nitrogen fertilizer needs to be supplemented by 25% in addition to the recommended level in 474 ha area where OC is low and medium.For example, for rainfed maize, recommended level is 50 kg N per ha and an additional 12 kg /ha needs to be applied for all the crops grown in these plots.
- **Available Phosphorus:**An area of about 129 ha (25%) is low (<23 kg/ha) and 345 ha (68%) is medium (23-57 kg/ha) in available phosphorus. Hence for all the crops, 25% additional P-needs to be applied.
- **Available Potassium:**Available potassium is medium (145-337 kg/ha) in an area of 107 ha (21%) in the microwatersheds. For all crops, additional 25 % potassium may be applied in areas where it is low and medium. It is high in 367 ha (72%) area of the microwatersheds.
- **Available Sulphur:** Available sulphur is a very critical nutrient for oilseed crops. Available sulphur islow (<10 ppm) in 196 ha (38%), medium (10-20 ppm)in 95 ha (19%) in the microwatersheds. These areas need to be applied with magnesium sulphate or gypsum or Factamphos (p) fertitilizer (13% sulphur) for 2-3 years for the deficiency to be corrected. It is high in 183 ha (36%) area of the microwatersheds.
- **Available Boron:** An area of about 229 ha (45%) is medium (0.5-1.0 ppm) in available boron content.It is high in 245 ha (48%) area of the microwatersheds.The areas that are medium boron need to be applied with sodium borate @ 10kg/ha as soil application or 0.2% borax as foliar spray to correct the deficiency
- **Available iron:** It is sufficient in (>4.5 ppm) 104 ha (20%) and deficient (<4.5 ppm) in 370 ha (73%) of the microwatersheds. To manage iron deficiency, iron sulphate @25 kg/ha needs to be applied for 2-3 years.
- **Available manganese:** Entire area in the microwatersheds is sufficient (>1.0 ppm) in available manganese.

- **Available copper:**Entire area is sufficient (>0.2 ppm) in available copper in the microwatersheds.
- **Available Zinc:** It is deficient (<0.6 ppm) in 393 ha (77%) and sufficient (>0.6 ppm) in 81 ha (16%)area inthe microwatersheds. Application of zinc sulphate@25kg/ha is to be followed in areas that are deficient in available zinc.
- **Soil alkalinity:**The microwatersheds has 470 ha (92%) soils that are slightlyto very strongly alkaline. These areas need application of gypsum and wherever calcium is in excess, iron pyrites and element sulphur can be recommended. Management practices like treating repeatedly with good quality water to drain out the excess salts and provision of subsurface drainage and growing of salt tolerant crops like Casuarina, Acasia, Neem, Ber etc, are recommended.

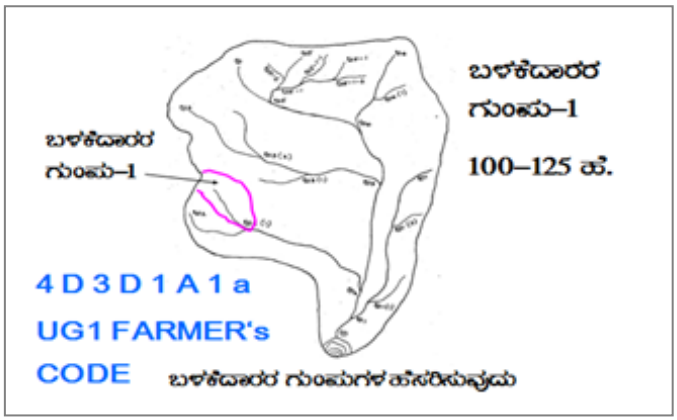
Land suitability for various crops: Areas that are highly, moderately and marginally suitable for growing various crops are indicated. Along with the suitability, various constraints that are limiting the productivity are also indicated. For example, in case of cotton, gravel content, rooting depth and salinity/alkalinity are the major constraints in various plots. With suitable management interventions, the productivity can be enhanced. In order to increase water holding capacity of light textured soils, growing of green manure crops and application of organic manure is recommended.

Chapter 9

SOIL AND WATER CONSERVATION TREATMENT PLAN

For preparing soil and water conservation treatment plan for Haligeri-2 & Haligeri-3 Microwatersheds, the land resource inventory database generated under Sujala-III project has been transformed as information through series of interpretative (thematic) maps using soil phase map as a base. The various thematic maps (1:7920 scale) generated were

- Soil depth
- Surface soil texture
- Available water capacity
- Soil slope
- Soil gravelliness
- Land capability
- Present land use and land cover
- Crop suitability maps
- Rainfall map
- Hydrology
- Water Resources
- Socio-economic data



- Contour plan with existing features- network of waterways, pothissa boundaries, cut up/ minor terraces etc.
- Cadastral map (1:7920 scale)
- Satellite imagery (1:7920 scale)

  Apart from these,Hand Level/ Hydro Marker/ Dumpy Level/ Total Station and Kathedars' List to be collected.

Steps for Survey and Preparation of Treatment Plan

The boundaries of Land User Groups' and Survey No. boundaries are traced in the field.

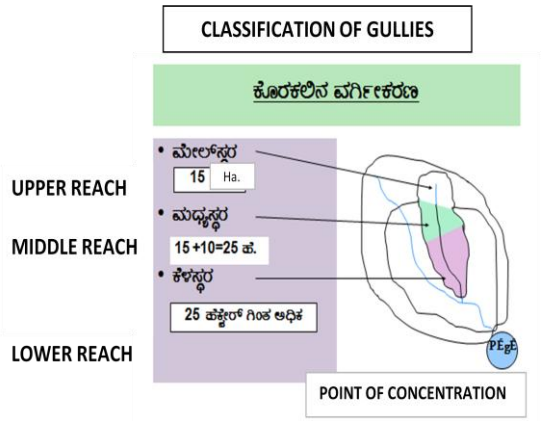
- Naming of user groups and farmers
- Identification of arable and non arable lands
- Identification of drainage lines and gullies
- Identification of non treatable areas
- Identification of priority areas in the arable lands
- Treatment plan for arable lands
- Location of water harvesting and recharge structures

9.1 Treatment Plan

The treatment plan recommended for arable lands is briefly described below.

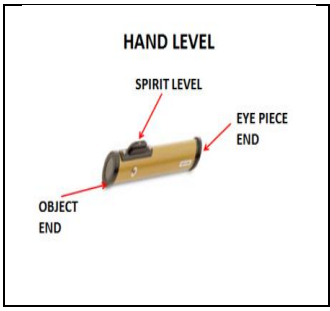
9.1.1 Arable Land Treatment

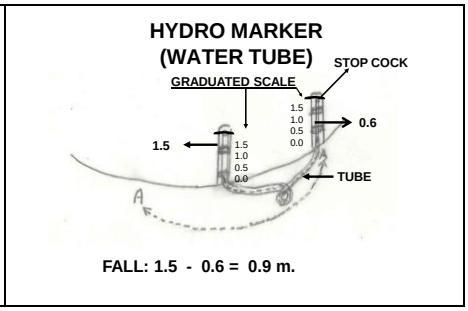
A. BUNDING

Steps for Survey and Preparation of Treatment Plan		USER GROUP-1
Cadastral map (1:7920 scale) is enlarged to a scale of 1:2500 scale Existing network of waterways, pothissa boundaries, grass belts, natural drainage lines/ watercourse, cut ups/ terraces are marked on the cadastral map to the scale Drainage lines are demarcated into		
Small gullies	(up to 5 ha catchment)	
Medium gullies	(5-15 ha catchment)	
Ravines	(15-25 ha catchment) and	
Halla/Nala	(more than 25ha catchment)	

Measurement of Land Slope

Land slope is estimated or determined by the study and interpretation of contours or by measurement in the field using simple instruments like Hand Level or Hydromarker.





Vertical and Horizontal intervals between bunds as recommended by the Watershed Development Department.

Slope percentage	Vertical interval (m)	Corresponding Horizontal Distance (m)
2 - 3%	0.6	24
3 - 4%	0.9	21
4 - 5%	0.9	21
5 - 6%	1.2	21
6 - 7%	1.2	21

Note: i) The above intervals are maximum.

(ii) Considering the slope class and erosion status (A1… A= 0-1% slope, 1= slight erosion) the intervals have to be decided.

Bund length recording:Considering the contour plan and the existing grass belts/partitions, the bunds are aligned and lengths are measured.

Section of the Bund

Bund section is decided considering the soil texture class and gravelliness class (bg_0...b=loamy sand, g_0 = <15% gravel). The recommended sections for different soils are given below.

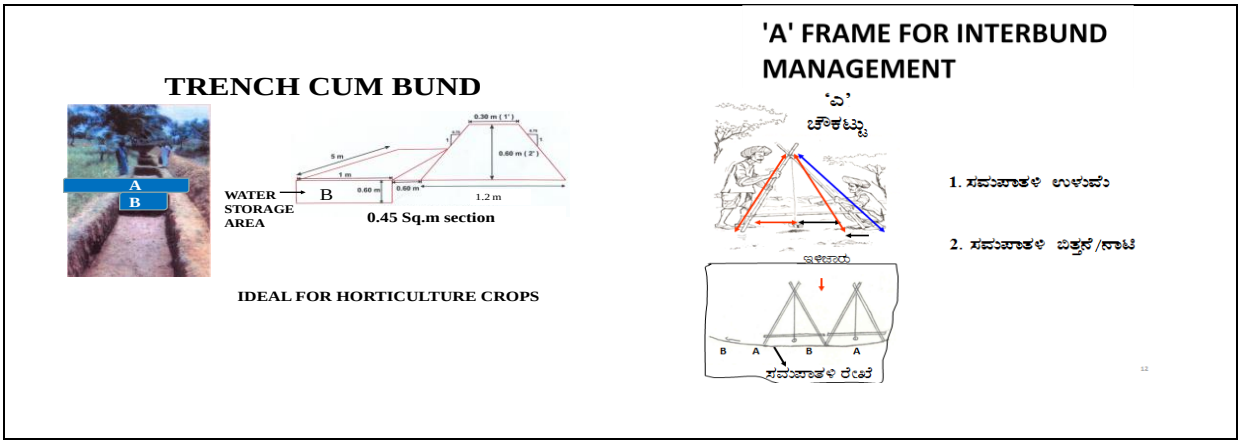
Recommended Bund Section

Top width(m)	Base width(m)	Height (m)	Side slope (Z:1;H:V)	Cross section (sq m)	Soil Texture	Remarks
0.3	0.9	0.3	01:01	0.18	Sandy loam	Vegetative bund
0.3	1.2	0.3	1.5:1	0.225	Sandy clay	
0.3	1.2	0.5	0.9:1	0.375	Red gravelly soils	
0.3	1.2	0.6	0.75:1	0.45		
0.3	1.5	0.6	01:01	0.54	Red sandy loam	
0.3	2.1	0.6	1.5:1	0.72	Very shallow black clayey soils	
0.45	2	0.75	01:01	0.92		
0.45	2.4	0.75	1.3:1	1.07	Shallow black clayey soils	
0.6	3.1	0.7	1.78:1	1.29	Medium black clayey soils	
0.5	3	0.85	1.47:1	1.49		

Formation of Trench cum Bund

Dimensions of the Borrow Pits/ Trenches to be excavated (machinery are decided considering the Bund Section).

Details of Borrow Pit dimensions are given below



Size of Borrow Pits/ Trench recommended for Trench cum Bund (by machinery)

Bund section	Bund length	Earth quantity	Pit				Berm (pit to pit)	Soil depth Class
m^2	m	m^3	L(m)	W(m)	D(m)	QUANTITY (m^3)	m	
0.375	6	2.25	5.85	0.85	0.45	2.24	0.15	Shallow
0.45	6	2.7	5.4	1.2	0.43	2.79	0.6	Shallow
0.45	6	2.7	5	0.85	0.65	2.76	1	Moderately Shallow
0.54	5.6	3.02	5.5	0.85	0.7	3.27	0.1	Moderately shallow
0.54	5.5	2.97	5	1.2	0.5	3	0.5	Shallow
0.72	6.2	4.46	6	1.2	0.7	5.04	0.2	Moderately shallow
0.72	5.2	3.74	5.1	0.85	0.9	3.9	0.1	Moderately deep

B. Waterways

a) Existing waterways are marked on the cadastral map (1:7920 scale) andtheir dimensions are recorded.

b) Considering the contour plan of the MWS, additional waterways/ modernization of the existing ones can be thought of.

c) The design details are given in the Manual.

C. Farm Ponds

Waterways and the catchment area will give an indication on the size of the Farm Pond. Location of the pond can be decided based on the contour plan/ field condition and farmers' need/desire.

D. Diversion Channel

Existing EPT/ CPT are marked on the cadastral map. Looking to the need, these can be modernized or fresh diversion channel can be proposed and runoff from this can be stored in *Gokatte*/ Recharge ponds.

9.1.2 Non-Arable Land Treatment

Depending on the gravelliness and crops preferred by the farmers, the concerned authorities can decide appropriate treatment plan. The recommended treatments may be Contour Trench, Staggered Trench, Crescent Bund, Boulder Bund or Pebble Bund are formed in the field.

9.1.3 Treatment of Natural Water Course/ Drainage Lines

a) The cadastral map has to be updated as regards the network of drainage lines (gullies/ *nalas/ hallas*) and existing structures are marked to the scale and storage capacity of the existing water bodies are documented.
b) The drainage line will be demarcated into Upper Reach, Middle Reach and Lower Reach.
c) Considering the Catchment, *Nala* bed and bank conditions, suitable structures are decided.
d) Number of storage structures (Check dam/ *Nala* bund/ Percolation tank) will be decided considering the commitments and available runoff in water budgeting and quality of water in the wells and site suitability.
e) Detailed Leveling Survey using Dumpy Level / Total Station has to be carried out to arrive at the site-specific designs as shown in the Manual.
f) The location of ground water recharge structures are decided by examining the lineaments and fracture zones from geological maps.
g) Rainfall intensity data of the nearest Rain Gauge Station is considered for Hydrologic Designs.
h) Silt load to the Storage/Recharge Structures is reduced by providing vegetative, boulder and earthen checks in the natural water course. Location and design details are given in the Manual.

9.2 Recommended Soil and Water Conservation Measures

The appropriate conservation structures best suited for each of the land parcel/ survey number (Appendix-I) are selected based on the slope per cent, severity of erosion, amount of rainfall, land use and soil type. The different kinds of conservation structures recommended are

1. Graded / Strengthening of Bunds
2. Trench cum Bunds (TCB)
3. Trench cum Bunds / Strengthening
4. Crescent Bunds

A map (Fig. 9.1) showing soil and water conservation plan with different kinds of structures recommended has been prepared which shows the spatial distribution and extent of area. A maximum area of about 174 ha (34%) requires Trench cum Bunding and about 293 ha (58%)area requires Graded Bunding and 7 ha (1%) requires Strengthening of existing Bunds / Bunding in the microwatersheds.The conservation plan prepared may be presented to all the stakeholders including farmers and after considering suggestions, the conservation plan for the microwatersheds may be finalised in a participatory approach.

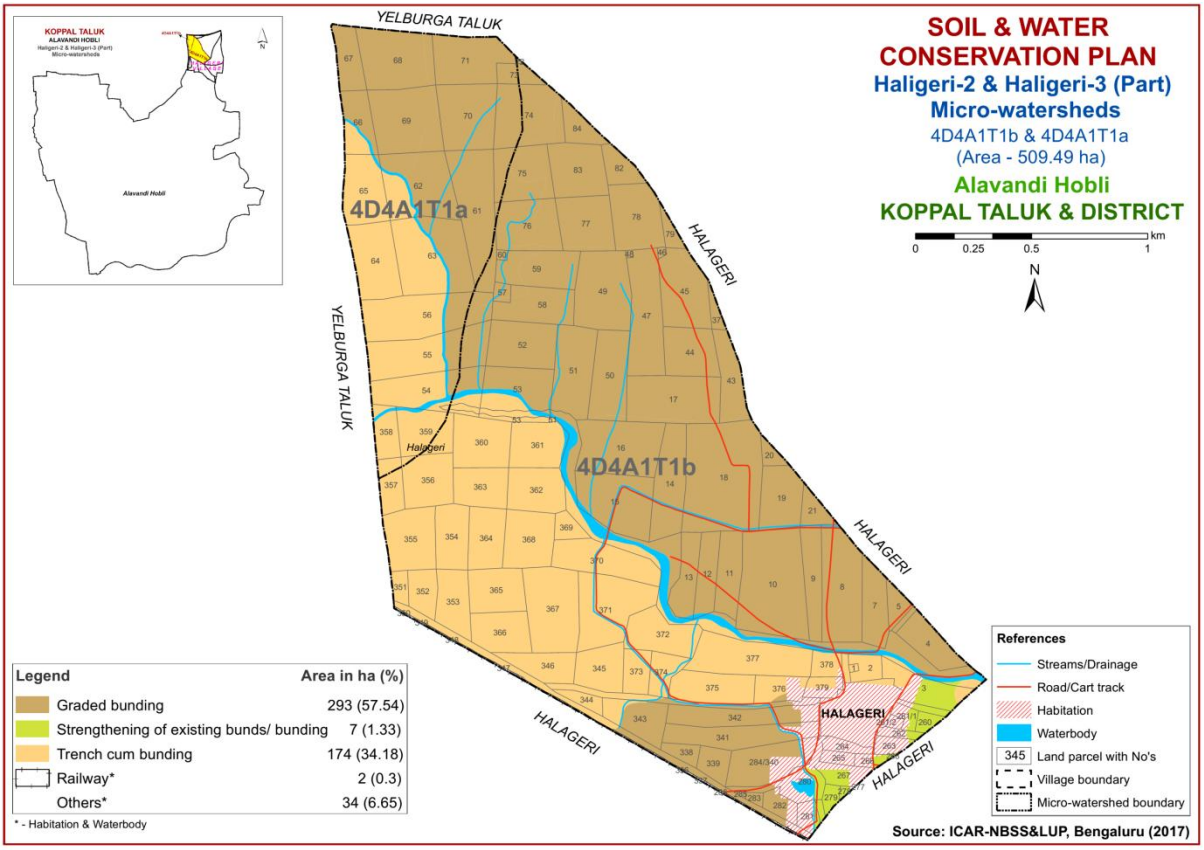


Fig. 9.1 Soil and Water Conservation Plan map of Haligeri-2 & Haligeri-3 Microwatersheds

9.3 Greening of Microwatersheds

As part of the greening programme in the watersheds, it is envisaged to plant a variety of horticultural and other tree plants that are edible, economical and produce lot of biomass which helps to restore the ecological balance in the watersheds. The lands that are suitable for greening programme are non-arable lands (land capability classes V, VI VII and VIII) and also the lands that are not suitable or marginally suitable for growing annual and perennial crops. The method of planting these trees is given below.

It is recommended to open the pits during the 1st week of March along the contour and heap the dug out soil on the lower side of the slope in order to harness the flowing water and facilitate weathering of soil in the pit. Exposure of soil in the pit also prevents spread of pests and diseases due to scorching sun rays. The pits should be filled with mixture of soil and organic manure during the second week of April and keep ready with sufficiently tall seedlings produced either in poly bags or in root trainer nurseries so that planting can be done during the 2nd or 3rd week of April depending on the rainfall.

The tree species suitable for the area considering rainfall, temperature and adaptability is listed below; waterlogged areas are recommended to be planted with species like Neral (*Sizyziumcumini*) and Bamboo. Dry areas are to be planted with species like Honge, Bevu, Seetaphal*etc*.

Dry Deciduous Species			Temp (°C)	Rainfall(mm)
1.	Bevu	*Azadiracta indica*	21–32	400 –1,200
2.	Tapasi	*Holoptelia integrifolia*	20-30	500 - 1000
3.	Seetaphal	*Anona Squamosa*	20-40	400 - 1000
4.	Honge	*Pongamia pinnata*	20 -50	500–2,500
5.	Kamara	*Hardwikia binata*	25 -35	400 - 1000
6.	Bage	*Albezzia lebbek*	20 - 45	500 - 1000
7.	Ficus	*Ficus bengalensis*	20 - 50	500–2,500
8.	Sisso	*Dalbargia Sissoo*	20 - 50	500 -2000
9.	Ailanthus	*Ailanthus excelsa*	20 - 50	500 - 1000
10.	Hale	*Wrightia tinctoria*	25 - 45	500 - 1000
11.	Uded	*Steriospermum chelanoides*	25 - 45	500 -2000
12.	Dhupa	*Boswella Serrata*	20 - 40	500 - 2000
13.	Nelli	*Emblica Officinalis*	20 - 50	500 -1500
14.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 2000
Moist Deciduous Species			**Temp (°C)**	**Rainfall (mm)**
15.	Teak	*Tectona grandis*	20 - 50	500-5000
16.	Nandi	*Legarstroemia lanceolata*	20 - 40	500 - 4000
17.	Honne	*Pterocarpus marsupium*	20 - 40	500 - 3000
18.	Mathi	*Terminalia alata*	20 -50	500 - 2000
19.	Shivane	*Gmelina arboria*	20 -50	500 -2000
20.	Kindal	*T.Paniculata*	20 - 40	500 - 1500
21.	Beete	*Dalbargia latifolia*	20 - 40	500 - 1500
22.	Tare	*T. belerica*	20 - 40	500 - 2000
23.	Bamboo	*Bambusa arundinasia*	20 - 40	500 - 2500
24.	Bamboo	*Dendrocalamus strictus*	20 – 40	500 – 2500
25.	Muthuga	*Butea monosperma*	20 - 40	400 - 1500
26.	Hippe	*Madhuca latifolia*	20 - 40	500 - 2000
27.	Sandal	*Santalum album*	20 - 50	400 - 1000
28.	Nelli	*Emblica officinalis*	20 - 40	500 - 2000
29.	Nerale	*Sizyzium cumini*	20 - 40	500 - 2000
30.	Dhaman	*Grevia tilifolia*	20 - 40	500 - 2000
31.	Kaval	*Careya arborea*	20 - 40	500 - 2000
32.	Harada	*Terminalia chebula*	20 - 40	500 - 2000

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Appendix I

Haligeri-2 & 3 Microwatershed

Soil Phase Information

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Halageri	1	0.13	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Halageri	2	1.46	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Not Available (NA)	Not Available	IIes	TCB
Halageri	3	4	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	Field bunds/ bunding
Halageri	4	3.44	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	5	1.33	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower+Maize (Sf+Mz)	Not Available	IIIes	Graded bunding
Halageri	7	3.76	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Maize (Cf+Mz)	Not Available	IIIes	Graded bunding
Halageri	8	8.18	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Maize (Cf+Mz)	Not Available	IIIes	Graded bunding
Halageri	9	3.74	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower+Cotton+ Chilli (Sf+Ct+Ch)	2 Borewell	IIIes	Graded bunding
Halageri	10	12.67	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Current fallow+Cotton (Mz+Cf+Ct)	Not Available	IIIes	Graded bunding
Halageri	11	3.72	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Graded bunding
Halageri	12	3.05	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Graded bunding
Halageri	13	3.29	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIIes	Graded bunding
Halageri	14	6.12	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	15	7.61	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Maize (Cf+Mz)	Not Available	IIIes	Graded bunding
Halageri	16	8.12	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	17	8.14	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	18	15.32	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	19	4.65	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIIes	Graded bunding
Halageri	20	0.83	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	21	1.53	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Bajra	Not Available	IIIes	Graded bunding

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
											(Cf+Bj)			
Halageri	37	0.72	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	43	3.78	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	44	4.71	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	45	6.4	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	46	0.15	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIes	Graded bunding
Halageri	47	7.61	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	48	0.09	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	49	7.82	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Halageri	50	5.89	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	51	6.46	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	52	5.77	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	53	6.15	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	Graded bunding
Halageri	54	7.18	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fallowland+Maize+Sunflower (Fl+Mz+Sf)	1 Borewell	IIs	TCB
Halageri	55	8.72	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Sugarcane (Cf+Sc)	1 Borewell	IIs	TCB
Halageri	56	9.44	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Sugarcane (Cf+Sc)	2 Borewell	IIs	TCB
Halageri	57	0.59	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	58	4.9	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Maize (Cf+Mz)	Not Available	IIes	Graded bunding
Halageri	59	5.26	NSPmB2	LMU-1	Moderately deep (75-100 cm)	Clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIes	Graded bunding
Halageri	60	0.2	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Fallow land (Fl)	Not Available	IIIes	Graded bunding
Halageri	61	8.98	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding
Halageri	62	8.4	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Halageri	63	10.18	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Fallowland+Current fallow+ Maize (Fl+Cf+Mz)	Not Available	IIs	TCB
Halageri	64	6.08	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Bajra (Cf+Bj)	Not Available	IIs	TCB
Halageri	65	5.21	BSRiB1g1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIs	TCB
Halageri	66	3.5	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current fallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding
Halageri	67	2.98	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding
Halageri	68	7.82	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Greengram (Cf+Gg)	Not Available	IIIes	Graded bunding
Halageri	69	8.15	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	70	6.79	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding
Halageri	71	6.24	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	72	0.03	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	73	1.49	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	74	7.56	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	75	5.73	MTLmB2g1	LMU-4	Shallow (25-50 cm)	Clay	Gravelly (15-35%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	76	5.99	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIIes	Graded bunding
Halageri	77	5.43	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	78	5.9	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	79	0.92	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	82	2.03	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	83	5.37	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	84	2.01	MTLmB2	LMU-4	Shallow (25-50 cm)	Clay	Non gravelly (<15%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIIes	Graded bunding
Halageri	260	0.72	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	Field bunds/ bunding
Halageri	261/1	0.87	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Halageri	261/2	0.33	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	262	0.71	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Bajra (Bj)	Not Available	Others	Others
Halageri	263	1.04	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Bajra (Bj)	Not Available	Others	Others
Halageri	264	1.03	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	265	0.78	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	266	0.77	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	267	1.76	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	268	0.02	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Currentfallow+Fallow land (Cf+Fl)	Not Available	IIs	Field bunds/ bunding
Halageri	277	0	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Not Available (NA)	Not Available	Others	Others
Halageri	278	0.21	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIs	Field bunds/ bunding
Halageri	279	0.73	CKMiA1	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Non gravelly (<15%)	Medium (101-150 mm/m)	Nearly level (0-1%)	Slight	Not Available (NA)	Not Available	IIs	Field bunds/ bunding
Halageri	280	3.42	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	281	1.11	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others
Halageri	282	1.44	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Habitation	Not Available	IIs	Graded bunding
Halageri	283	0.35	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	Graded bunding
Halageri	284/340	5.6	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	Graded bunding
Halageri	285	0.08	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	Graded bunding
Halageri	336	0.01	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Current Fallow (Cf)	Not Available	Railway	Railway
Halageri	337	0.02	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Current Fallow (Cf)	Not Available	Railway	Railway
Halageri	338	1.1	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	Graded bunding
Halageri	339	1.77	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	Graded bunding
Halageri	341	5.72	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	1 Borewell	IIs	Graded bunding
Halageri	342	5.16	NSPiB1g1	LMU-1	Moderately deep (75-100 cm)	Sandy clay	Gravelly (15-35%)	Medium (101-150 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Bajra (Cf+Bj)	Not Available	IIs	Graded bunding
Hala	343	3.92	NSPiB1g1	LMU-1	Moderately deep	Sandy clay	Gravelly (15-	Medium (101-	Very gently	Slight	Bajra (Bj)	Not	IIs	Graded

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
geri					(75-100 cm)		35%)	150 mm/m)	sloping (1-3%)			Available		bunding
Halageri	344	1.05	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	TCB
Halageri	345	3.84	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Maize (Cf+Mz)	Not Available	IIes	TCB
Halageri	346	3.29	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Maize (Cf+Mz)	Not Available	IIes	TCB
Halageri	347	0.13	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Current Fallow (Cf)	Not Available	Railway	Railway
Halageri	348	0.05	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Greengram (Gg)	Not Available	Railway	Railway
Halageri	349	0.08	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Bajra+Maize (Bj+Mz)	Not Available	Railway	Railway
Halageri	350	0.02	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Bajra (Bj)	Not Available	Railway	Railway
Halageri	351	0.97	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra (Bj)	Not Available	IIs	TCB
Halageri	352	2.34	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	TCB
Halageri	353	3.81	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Sunflower+Bajra (Sf+Bj)	Not Available	IIs	TCB
Halageri	354	3.99	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	TCB
Halageri	355	5.6	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Currentfallow+Maize (Cf+Mz)	Not Available	IIs	TCB
Halageri	356	4.87	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current fallow+Maize (Cf+Mz)	Not Available	IIs	TCB
Halageri	357	2.4	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Current Fallow (Cf)	Not Available	IIs	TCB
Halageri	358	2.4	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Maize (Mz)	Not Available	IIs	TCB
Halageri	359	4.59	BSRiB1g2	LMU-2	Moderately deep (75-100 cm)	Sandy clay	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Slight	Bajra+Maize (Bj+Mz)	Not Available	IIs	TCB
Halageri	360	5.31	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower+Maize (Sf+Mz)	Not Available	IIes	TCB
Halageri	361	4.6	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower+Current fallow (Sf+Cf)	Not Available	IIes	TCB
Halageri	362	4.62	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Current fallow+Groundnut (Bj+Cf+Gn)	1 Borewell	IIes	TCB
Halageri	363	3.95	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Maize (Cf+Mz)	1 Borewell	IIes	TCB
Halageri	364	4.1	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Maize (Cf+Mz)	Not Available	IIes	TCB
Halageri	365	4.5	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Maize (Bj+Mz)	Not Available	IIes	TCB

Village	Sy No	Area (ha)	Soil Phase	LMU	Soil Depth	Surface Soil Texture	Soil Gravelliness	Available Water Capacity	Slope	Soil Erosion	Current Land Use	Wells	Land Capability	Conservation Plan
Halageri	366	4.24	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Current fallow+Sunflower (Bj+Cf+Sf)	Not Available	IIes	TCB
Halageri	367	8.15	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Current fallow+Maize (Bj+Cf+Mz)	Not Available	IIes	TCB
Halageri	368	5.16	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	TCB
Halageri	369	1.28	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	1 Borewell	IIes	TCB
Halageri	370	5.83	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Maize+Sunflower+Cotton (Mz+Sf+Ct)	Not Available	IIes	TCB
Halageri	371	8.03	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Currentfallow+Bajra+Sunflower (Cf+Bj+Sf)	1 Borewell	IIes	TCB
Halageri	372	4.84	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	TCB
Halageri	373	2.2	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	TCB
Halageri	374	2.17	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra (Bj)	Not Available	IIes	TCB
Halageri	375	4.69	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Greengram+Bajra+Sunflower (Gg+Bj+Sf)	Not Available	IIes	TCB
Halageri	376	2.44	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Current Fallow (Cf)	Not Available	IIes	TCB
Halageri	377	7.52	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Bajra+Maize (Bj+Mz)	1 Borewell	IIes	TCB
Halageri	378	1.45	TDHhB2g2	LMU-3	Moderately shallow (50-75 cm)	Sandy clay loam	Very gravelly (35-60%)	Low (51-100 mm/m)	Very gently sloping (1-3%)	Moderate	Sunflower (Sf)	Not Available	IIes	TCB
Halageri	379	1.36	Habitation	Habitation	Others	Others	Others	Others	Others	Others	Habitation	Not Available	Others	Others

Appendix II

Haligeri-2 &3 Microwatersheds

Soil Fertility Information

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Halageri	1	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	2	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	3	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	4	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	5	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	7	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	8	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	9	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	10	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	11	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	12	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	13	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	14	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	15	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	16	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	17	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	18	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	19	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	20	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	21	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	37	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	43	Strongly alkaline (pH	Non saline	Medium (0.5 –	Low (< 23	High (> 337	Low (<10	Medium (0.5 –	Deficient (< 4.5	Sufficient (> 1.0	Sufficient (> 0.2	Deficient (< 0.6

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		8.4 – 9.0)	(<2 dsm)	0.75 %)	kg/ha)	kg/ha)	ppm)	1.0 ppm)	ppm)	ppm)	ppm)	ppm)
Halageri	44	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	45	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	46	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	47	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	48	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	49	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	50	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	51	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	52	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	53	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	54	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	55	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	56	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	57	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	58	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	59	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	60	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	61	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	62	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	63	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	64	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	65	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	66	Strongly alkaline (pH 8.4 – 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Halageri	67	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	68	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	69	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	70	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	71	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	72	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	73	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	74	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	75	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	76	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	77	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	78	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	79	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	82	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	83	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	84	Very strongly alkaline (pH > 9.0)	Non saline (<2 dsm)	Low (< 0.5 %)	Low (< 23 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	260	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	261/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	261/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	262	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	263	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	264	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	265	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	266	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Halageri	267	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	268	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	277	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	278	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	279	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	280	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	281	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	282	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	283	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	284/340	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	285	Neutral (pH 6.5 – 7.3)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	336	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	337	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	338	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	339	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	341	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	342	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	343	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	344	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	345	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	346	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	347	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	348	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	349	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	350	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
Halageri	351	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	352	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	353	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	354	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	355	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	356	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	357	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	358	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	359	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	360	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	361	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	362	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	363	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	364	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	365	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	366	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	367	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	368	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	369	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Medium (10 – 20 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	370	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	371	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	Medium (145 – 337 kg/ha)	Low (<10 ppm)	Medium (0.5 – 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	372	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	373	Slightly alkaline (pH 7.3 – 7.8)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	Medium (0.5 – 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	374	Moderately alkaline (pH	Non saline	Medium (0.5 –	Medium (23 – 57	High (> 337	High (> 20	High (> 1.0	Sufficient (>4.5	Sufficient (> 1.0	Sufficient (> 0.2	Deficient (< 0.6

Village	Sy No.	Soil Reaction	Salinity	Organic Carbon	Available Phosphorus	Available Potassium	Available Sulphur	Available Boron	Available Iron	Available Manganese	Available Copper	Available Zinc
		7.8 – 8.4)	(<2 dsm)	0.75 %)	kg/ha)	kg/ha)	ppm)	ppm)	ppm)	ppm)	ppm)	ppm)
Halageri	375	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	376	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Sufficient (>4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	377	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Deficient (< 0.6 ppm)
Halageri	378	Moderately alkaline (pH 7.8 – 8.4)	Non saline (<2 dsm)	Medium (0.5 – 0.75 %)	Medium (23 – 57 kg/ha)	High (> 337 kg/ha)	High (> 20 ppm)	High (> 1.0 ppm)	Deficient (< 4.5 ppm)	Sufficient (> 1.0 ppm)	Sufficient (> 0.2 ppm)	Sufficient (> 0.6 ppm)
Halageri	379	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

Appendix III

Haligeri-2& 3 Microwatersheds

Soil Suitability Information

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Halageri	1	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	2	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	3	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2tg	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2tg	S2r	S2r
Halageri	4	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	5	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	7	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	8	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	9	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	10	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	11	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	12	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	13	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	14	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	15	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	16	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	17	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	18	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	19	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	20	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	21	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	37	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Halageri	43	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	44	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	45	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	46	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	47	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	48	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	49	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	50	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	51	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	52	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	53	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	54	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2tg	S2r	S2rg	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2tg	S2r	S2r
Halageri	55	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2tg	S2r	S2rg	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2tg	S2r	S2r
Halageri	56	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2tg	S2r	S2rg	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2tg	S2r	S2r
Halageri	57	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	58	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	59	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2r	S1	S2r	S2t	S2t	S3t	S1	N1t	S3rt	S2r	S3t	S3t	S3tw	S2tw	S2tw	S2rt	S3t	S3tw	S3t	S2rt	S2tw
Halageri	60	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	61	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	62	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	63	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2tg	S2r	S2rg	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2tg	S2r	S2r
Halageri	64	S3r	S2tg	S2rg	S2g	S2rt	S2rg	S3r	S2rg	S2tg	S2r	S2rg	S1	S2rg	S1	S2rt	S2rg	S2rg	S2t	S1	S1	S2tg	S2tg	S2rg	S1	S2tg	S2tg	S2r	S2r
Halag	65	S3r	S2tg	S2r	S2g	S2rt	S2r	S3r	S2r	S2t	S2r	S2r	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2t	S2r	S1	S2t	S2t	S2r	S2r

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
eri				g			g		g	g		g		g			g	g				g	g	g		g	g		
Halageri	66	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	67	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	68	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	69	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	70	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	71	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	72	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	73	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	74	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	75	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	76	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	77	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	78	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	79	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	82	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	83	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	84	N1rt	S3tz	N1rz	S3rz	N1rt	S3rz	N1rz	N1rz	S3rz	N1rz	N1rz	S3tz	N1rt	S3zg	N1rt	N1rt	N1rz	S3tz	S3rz	S3rz	S3rz	S3rz	N1rz	S3rz	S3rz	S3rz	N1rz	N1rz
Halageri	260	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2tg	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2tg	S2r	S2r
Halageri	261/1	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	261/2	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	262	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	263	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halag	264	Othe	Other	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe	Othe

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
eri		rs	s	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs	rs
Halageri	265	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	266	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	267	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	268	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2tg	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2tg	S2r	S2r
Halageri	277	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	278	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2tg	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2tg	S2r	S2r
Halageri	279	S3r	S2t	S2rg	S1	S2rt	S2rg	S3r	S2r	S2tg	S2r	S2rg	S1	S2r	S1	S2rt	S2r	S2r	S2t	S1	S1	S2t	S2tg	S2r	S1	S2tg	S2tg	S2r	S2r
Halageri	280	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	281	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others
Halageri	282	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	283	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	284/340	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	285	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	336	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	337	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	338	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	339	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	341	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	342	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	343	S3rt	S3t	S3rt	S1	S3t	S1	S3r	S2rg	S1	S2rg	S2tg	S2tg	S3t	S1	N1t	S3rt	S2rg	S3t	S3t	S3t	S2tg	S2tg	S2rt	S3t	S3t	S3t	S2rt	S2tg
Halageri	344	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	345	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
Halageri	346	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	347	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	348	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	349	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	350	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway	Railway
Halageri	351	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	352	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	353	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	354	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	355	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	356	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	357	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	358	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	359	S3rg	S3g	S3rg	S3g	S2rt	S3g	S3rg	S2rg	S3g	S2r	S3g	S2g	S2rg	S2g	S2rt	S2rg	S3rg	S2g	S3g	S3g	S3g	S3g	S3rg	S3g	S3g	S3g	S3g	S2g
Halageri	360	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	361	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	362	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	363	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	364	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	365	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	366	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	367	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halag	368	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r

Village	Sy No	Mango	Maize	Sapota	Sorgham	Guava	Cotton	Tamarind	Lime	Bengalgram	Sunflower	Redgram	Amla	Jackfruit	Custard-apple	Cashew	Jamun	Musambi	Groundnut	Chilly	Tomato	Marigold	Chrysanthemum	Pomegranate	Bajra	Jasmine	Crsndra	Dstick	Mulberry
eri																													
Halageri	369	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	370	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	371	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	372	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	373	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	374	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	375	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	376	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	377	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	378	N1r	S2r	S3r	S2r	S3r	S2r	N1r	S3r	S2rt	S3r	S3r	S2r	S3r	S2r	S3r	S3r	S3r	S2r	S2r	S2r	S2r	S2r	S3r	S2r	S2r	S2r	S3r	S3r
Halageri	379	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others	Others

PART-B

SOCIO-ECONOMIC STATUS OF FARM HOUSEHOLDS

CONTENTS

LIST OF TABLES

Chapter 1

SALIENT FINDINGS OF THE SURVEY

- *The data indicated that there were 95 (56.55%) men and 73 (43.45%) women among the sampled households.*
- *The average family size of landless farmers' was 4, marginal farmers' was 4.92, small farmers' was 4.1, semi medium farmers' was 5.2 and medium farmers' was 4.*
- *The data indicated that, 28 (16.67%) people were in 0-15 years of age, 73 (43.45%) were in 16-35 years of age, 46 (27.38%) were in 36-60 years of age and 21 (12.50%) were above 61 years of age.*
- *The results indicated that Haligeri-2 & Haligeri-3 had 26.79 per cent illiterates, 1.19 per cent of them had functional illiterates, 24.40 per cent of them had primary school education, 4.76 per cent of them had middle school education, 21.43 per cent of them had high school education, 10.12 per cent of them had PUC education, 1.79 per cent of them had ITI, 5.95 per cent of them had degree education and 0.60 per cent did master's and Ph.D.*
- *The results indicate that, 48.65 per cent of households were practicing agriculture, 45.95 per cent of the households were agricultural labourers, 8.11 per cent of the households were general labourers and 2.70 per cent of them were student.*
- *The results indicate that agriculture was the major occupation for 32.14 per cent of the household members, 29.76 per cent were agricultural laborers, 5.36 per cent were general labourers, 0.60 per cent were in government service, 3.57 per cent were in private service, 25.60 per cent were students, 1.19 per cent were housewives and 1.79 per cent were children.*
- *The results show that 100 per cent of the population in the micro watershed has not participated in any local institutions.*
- *The results indicate that 2.70 per cent of the households possess thatched house, 86.49 per cent of the households possess katcha house and 10.81 per cent of them possess pucca house.*
- *The results show that 62.16 per cent of the households possess TV, 54.05 per cent of the households possess mixer/grinder, 8.11 per cent of the households possess bicycle, 18.92 per cent of the households possess motor cycle, and 97.30 per cent of the households possess mobile phones.*
- *The results show that the average value of television was Rs. 8,782, mixer/grinder was Rs.2,075, bivycle was Rs. 11,166, motor cycle was Rs. 34,000 and mobile phone was Rs. 2,807.*
- *About 2.70 per cent of the households possess bullock cart, 18.92 per cent of the households possess plough, 56.76 per cent of them weeder and 8.11 per cent of them possess chaff cutter.*
- *The results show that the average value of bullock cart was Rs. 21,000, plough was Rs.1,000, average value of weeder was Rs.48 and chaff cutter was Rs. 266.*

- *The results indicate that, 24.32 per cent of the households possess bullocks, 16.22 per cent of the households possess local cow and 2.70 per cent of them possess crossbreed cow and sheep.*
- *The results indicate that, average own labour men available in the micro watershed was 1.76, average own labour (women) available was 1.24, average hired labour (men) available was 6.06 and average hired labour (women) available was 5.73.*
- *The results indicate that, 86.49 per cent of the households opined that the hired labour was adequate.*
- *The results indicate that, households of the Haligeri-2 & Haligeri-3 micro-watershed possess 28.39 ha (83.86%) of dry land and 5.46 ha (16.14%) of irrigated land. Marginal farmers possess 6.341 ha (87.81%) of dry land and 0.89 ha (12.19%) of irrigated land. Small farmers possess 10.64 ha (88.85%) of dry land and 1.34 ha (11.15%) of irrigated land. Semi medium farmers possess 11.33 ha (100.00%) of dry land. Medium farmers possess 3.24 ha (68.17%) of irrigated land.*
- *The results indicate that, the average value of dry land was Rs. 417,241.63 and average value of irrigated land was Rs. 402,518.52. In case of marginal famers, the average land value was Rs. 771,388.01 for dry land and Rs. 1,234,999.97 for irrigated land. In case of small famers, the average land value was Rs. 328,707.23 for dry land and Rs. 523,939.40 for irrigated land. In case of semi medium famers, the average land value was Rs. 299,928.57 for dry land. In case of medium farmers, the average land value was Rs. 123,500.00 for irrigated land.*
- *The results indicate that, there were 5 functioning bore wells in the micro watershed.*
- *The results indicate that, bore well was the major irrigation source in the micro water shed for 13.51 per cent of the farmers.*
- *The results indicate that, the depth of bore well was found to be 14.42 meters.*
- *The results indicate that, marginal, small and medium farmers had an irrigated area of 0.91 ha, 1.34 ha and 3.24 ha respectively.*
- *The results indicate that, farmers have grown bajra (2.64 ha), Bengal gram (0.81 ha), cotton (2.43 ha), green gram (1.26 ha), groundnut (4.53 ha), maize (15.96 ha) and sorghum (5.83 ha). Marginal farmers have grown bajra, Bengal gram, groundnut, maize and sunflower. Small farmers had grown bajra, cotton, greengram, groundnut, maize and sunflower. Semi medium farmers had grown groundnut, maize and sunflower. Medium farmers had grown maize.*
- *The results indicate that, the cropping intensity in Haligeri-2 & Haligeri-3 micro-watershed was found to be 99.93 per cent.*
- *The results indicate that, 2.70 per cent of the households have bank account and savings.*
- *The results indicate that, 2.70 per cent of the households have availed credit from different sources.*

- *The results indicate that, the total cost of cultivation for bajra was Rs. 79762.40. The gross income realized by the farmers was Rs. 59035.76. The net income from bajra cultivation was Rs. -20726.64, thus the benefit cost ratio was found to be 1:0.74.*
- *The total cost of cultivation for bengal gram was Rs. 60725.87. The gross income realized by the farmers was Rs. 93860.00. The net income from bengal gram cultivation was Rs. 33134.13, thus the benefit cost ratio was found to be 1:1.55.*
- *The total cost of cultivation for green gram was Rs. 22926.41. The gross income realized by the farmers was Rs. 39838.71. The net income from Green gram cultivation was Rs. 16912.30, thus the benefit cost ratio was found to be 1:1.74.*
- *The total cost of cultivation for groundnut was Rs. 40061.50. The gross income realized by the farmers was Rs. 28619.46. The net income from groundnut cultivation was Rs. -11442.04. Thus the benefit cost ratio was found to be 1:0.71.*
- *The total cost of cultivation for maize was Rs. 50934.85. The gross income realized by the farmers was Rs. 58580.03. The net income from maize cultivation was Rs.7645.18. Thus the benefit cost ratio was found to be 1:1.15.*
- *The total cost of cultivation for sunflower was Rs. 37226.95. The gross income realized by the farmers was Rs. 58951.17. The net income from sunflower cultivation was Rs. 21724.22. Thus the benefit cost ratio was found to be 1:1.58.*
- *The results indicate that, 37.84 per cent of the households opined that dry fodder was adequate and 43.24 per cent of the households opined that green fodder was adequate.*
- *The results indicate that the annual gross income was Rs. 52,857.14 for landless farmers, for marginal farmers it was Rs. 79,121.43, for small farmers it was Rs. 88,395, for semi medium farmers it was Rs. 118,570 and for medium farmers it was Rs. 75,000.*
- *The results indicate that the average annual expenditure is Rs. 7,554.34. For landless households it was Rs. 6,020.41, for marginal farmers it was Rs. 3,974.49, for small farmers it was Rs. 5,572.50, for semi medium farmers it was Rs. 16,000 and for medium farmers it was Rs. 46,000.*
- *The results indicate that, sampled households have grown 80 coconut tree and 1 mango trees in the field. Also, 1 coconut tree in the backyard.*
- *The results indicate that, households have planted 16 teak and 65 neem trees in their field.*
- *The results indicated that, bajra was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 93.75 per cent and cotton, green gram, groundnut, maize, and sunflower was sold to the extent of 100 per cent.*
- *The results indicated that, about 78.38 per cent of the farmers sold their produce to local/village merchants and 2.70 per cent of their produce to regulated markets.*

- *The results indicated that, 81.08 per cent of the households have used tractor as a mode of transportation for their agricultural produce.*
- *The results indicated that, 62.16 per cent of the households have experienced soil and water erosion problems in the farm.*
- *The results indicated that, 78.38 per cent have shown interest in soil test.*
- *The results indicated that, 83.72 per cent of the households used firewood and 16.22 per cent used LPG as a source of fuel.*
- *The results indicated that, piped supply was the major source of drinking water for 89.19 per cent and bore well and lake/tank was the source of drinking water for 5.41 per cent of the households in the micro watershed.*
- *Electricity was the major source of light for 100 per cent of the households in micro watershed.*
- *The results indicated that, 54.05 per cent of the households possess sanitary toilet.*
- *The results indicated that, 97.30 per cent of the sampled households possessed BPL card.*
- *The results indicated that, 24.32 per cent of the households participated in NREGA programme.*
- *The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 91.89 per cent, vegetables and fruits were adequate for 5.41 per cent, milk and meat was adequate for 97.30 per cent and eggs were adequate for 94.59 per cent.*
- *The results indicated that, pulses were inadequate for 8.11 per cent, oilseed were inadequate for 97.30 per cent, vegetables and fruits were inadequate for 94.59 per cent, milk and eggs were inadequate for 2.70 per cent of the households.*
- *The results indicated that, lower fertility status of the soil was the constraint experienced by 81.08 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases, inadequacy of irrigation water, high cost of fertilizers and plant protection chemicals was the constraint experienced by 78.38 per cent of the households, high rate of interest on credit (62.16%), low price for the agricultural commodities (56.76%), lack of marketing facilities in the area (29.73%), inadequate extension services (18.92%), lack of transport for the safe transport of agricultural produce to the market (10.81 %) and source of agri technology information (2.70 %).*

Chapter 2

INTRODUCTION

Soil and water are the two precious natural resources which are essential for crop production and existence of life on earth. Rainfed agriculture is under severe stress due to various constraints related to agriculture like uneven and erratic distribution of rainfall, indiscriminate use of fertilizers, chemicals and pesticides, adoption of improper land management practices, soil erosion, decline in soil fertility, decline in ground water resources leading to low crop productivity. The area under rainfed agriculture has to be managed effectively using the best available practices to enhance the production of food, fodder and fuel. This is possible if the land resources are characterized at each parcel of land through detailed land resource inventory using the best available techniques of remote sensing, GPS and GIS. The watershed development programs are aimed at the sustainable distribution of its resources and the process of creating and implementing plans, programs, and projects to sustain and enhance watershed functions that affect the plant, animal and human communities within a watershed boundary.

World Bank funded KWDP II, SUJALA III project was implemented in with Broad objective of demonstrating more effective watershed management through greater integration of programmes related to rain-fed agriculture, innovative and science based approaches and strengthen institutional capacities and If successful, it is expected that the systems and tools could be mainstreamed into the overall IWMP in the State of Karnataka and in time, throughout other IWMP operations in India. With this background the socio-economic survey has been carried out with following specific objectives:

1. To understand the demographic features of the households in the micro-watershed
2. To understand the extent of family labour available and additional employment opportunities available within the village.
3. To know the status of assets of households in the micro-watershed for suggesting possible improvements.
4. To study the cropping pattern, cropped area and productivity levels of different households in micro-watershed.
5. To determine the type and extent of livestock owned by different categories of HHs
6. Availability of fodder and level of livestock management.

Scope and importance of survey

Survey helps in identification of different socio-economic and resource use-patterns of farmers at the Micro watershed. Household survey provides demographic features, labour force, and levels of education; land ownership and asset position (including livestock and other household assets) of surveyed households; and cropping patterns, input intensities, and average crop yields from farmers' fields. It also discusses crop utilization and the degree of commercialization of production in the areas; farmers' access to and utilization of credit from formal and informal sources; and the level of adoption and use of soil, water,and pest management technologies.

Chapter 3

METHODOLOGY

The description of the methods, components selected for the survey and procedures followed in conducting the baseline survey are furnished under the following heads.

Description of the study area

Koppal district is an administrative district in the state of Karnataka in India. In the past Koppal was referred to as 'Kopana Nagara'. Koppal, now a district headquarters is ancient Kopana a major holy place of the Jainas. The district occupies an area of 7,190 km² and has a population of 1,196,089, which 16.58% were urban as of 2001. The Koppal district was formed after split of Raichur district.

Geographers are very particular about the physiography or relief of a region. It plays a very important role in the spatial analysis of agricultural situation of the study area. The undulating topography with black cotton soil shrips, cut across by numerous nalas or streams is the major characteristic feature of the study region. Three physiographic divisions have made considering the local conditions of landforms and crops grown in the district. On the basis of physiography, Koppal district can be divided into three major divisions. They are (a) Koppal & Yelburga plateau, (b) Maidan division, (c) Tungabhadra valley. The district is part of Krishna basin the main streams draining the area are Maskinala, Ilkal-nadi and Hirenala. These are Ephemaral in nature, these come under Tungabhadra sub-basin. The drainage exhibit dentritic to subdentric with drainage density varies from 1.4 to7.0kms/sq.km.

According to the 2011 census Koppal district has a population of 1,391,292, roughly equal to the nation of Swaziland or the US state of Hawaii. This gives it a ranking of 350th in India (out of a total of 640). The district has a population density of 250 inhabitants per square kilometre (650/sq mi). Its population growth rate over the decade 2001-2011 was 16.32%.Koppal has a sex ratio of 983 females for every 1000 males, and a literacy rate of 67.28%.

Description of the micro watershed

Haligeri-2 & Haligeri-3 and Haligeri-3 micro-watershed in Haligeri sub-watershed (Koppal taluk and district) is located in between $15^0$23’596’’ to 15^0 21’59.83” North latitudes and 76^0 5’12.956’’ to $76^0$3’46.562’’ East longitudes, covering an area of about 509.49 ha, bounded by Halageri village.

Methodology followed in assessing socio-economic status of households

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyze the data. About 37 households located in the micro-watershed were interviewed for the survey.

Chapter 4

SALIENT FEATURES OF THE SURVEY

Households sampled for socio-economic survey: The data on households sampled for socio economic survey in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 1 and it indicated that 37 farmers were sampled in Haligeri-2 & Haligeri-3 micro-watershed among them 7 (18.92%) were landless, 14 (37.84%) were marginal farmers, 10 (27.03%) were small farmers, 5 (13.51%) were semi medium farmers and 1 (2.70%) was medium farmer.

Table 1: Households sampled for socio economic survey in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Farmers	7	18.92	14	37.84	10	27.03	5	13.51	1	2.70	37	100.00

Population characteristics: The population characteristics of households sampled for socio-economic survey in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 2. The data indicated that there were 95 (56.55%) men and 73 (43.45%) women among the sampled households. The average family size of landless farmers' was 4, marginal farmers' was 4.92, small farmers' was 4.1, semi medium farmers' was 5.2 and medium farmers' was 4.

Table 2: Population characteristics of Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (28)		MF (69)		SF (41)		SMF (26)		MDF (4)		All (168)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Men	15	53.57	41	59.42	23	56.10	14	53.85	2	50.00	95	56.55
2	Women	13	46.43	28	40.58	18	43.90	12	46.15	2	50.00	73	43.45
Total		28	100.00	69	100.00	41	100.00	26	100.00	4	100.00	168	100.00
Average		4		4.92		4.1		5.2		4		4.54	

Age wise classification of population: The age wise classification of household members in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 3. The data indicated that, 28 (16.67%) people were in 0-15 years of age, 73 (43.45%) were in 16-35 years of age, 46 (27.38%) were in 36-60 years of age and 21 (12.50%) were above 61 years of age.

Table 3: Age wise classification of household members in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (28)		MF (69)		SF (41)		SMF (26)		MDF (4)		All (168)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	0-15 years of age	4	14.29	12	17.39	9	21.95	3	11.54	0	0.00	28	16.67
2	16-35 years of age	16	57.14	29	42.03	13	31.71	13	50.00	2	50.00	73	43.45
3	36-60 years of age	6	21.43	22	31.88	9	21.95	7	26.92	2	50.00	46	27.38
4	> 61 years	2	7.14	6	8.70	10	24.39	3	11.54	0	0.00	21	12.50
Total		28	100.00	69	100.00	41	100.00	26	100.00	4	100.00	168	100.00

Education level of household members: Education level of household members in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 4. The results indicated

that Haligeri-2 & Haligeri-3 had 26.79 per cent illiterates, 1.19 per cent of them had functional illiterates, 24.40 per cent of them had primary school education, 4.76 per cent of them had middle school education, 21.43 per cent of them had high school education, 10.12 per cent of them had PUC education, 1.79 per cent of them had ITI, 5.95 per cent of them had degree education and 0.60 per cent did master's and Ph.D.

Table 4. Education level of household members in Haligeri-2 & Haligeri-3 micro-watershed

Sl. No.	Particulars	LL (28)		MF (69)		SF (41)		SMF (26)		MDF (4)		All (168)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Illiterate	12	42.86	18	26.09	8	19.51	5	19.23	2	50.00	45	26.79
2	Functional Literate	0	0.00	2	2.90	0	0.00	0	0.00	0	0.00	2	1.19
3	Primary School	5	17.86	16	23.19	16	39.02	4	15.38	0	0.00	41	24.40
4	Middle School	1	3.57	3	4.35	3	7.32	1	3.85	0	0.00	8	4.76
5	High School	5	17.86	16	23.19	3	7.32	11	42.31	1	25.00	36	21.43
6	PUC	3	10.71	8	11.59	4	9.76	2	7.69	0	0.00	17	10.12
7	ITI	0	0.00	0	0.00	2	4.88	0	0.00	1	25.00	3	1.79
8	Degree	0	0.00	4	5.80	4	9.76	2	7.69	0	0.00	10	5.95
9	Masters	0	0.00	0	0.00	0	0.00	1	3.85	0	0.00	1	0.60
10	Ph.D	0	0.00	1	1.45	0	0.00	0	0.00	0	0.00	1	0.60
11	Others	2	7.14	1	1.45	1	2.44	0	0.00	0	0.00	4	2.38
Total		28	100.00	69	100.00	41	100.00	26	100.00	4	100.00	168	100.00

Occupation of household heads: The data regarding the occupation of the household heads in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 5. The results indicate that, 48.65 per cent of households were practicing agriculture, 45.95 per cent of the households were agricultural labourers, 8.11 per cent of the households were general labourers and 2.70 per cent of them were student.

Table 5: Occupation of household heads in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0.00	5	35.71	9	90.00	4	80.00	0	0.00	17	48.65
2	Agricultural Labour	4	57.14	10	71.43	1	10.00	1	20.00	1	100.00	16	45.95
3	General Labour	3	42.86	0	0.00	0	0.00	0	0.00	0	0.00	3	8.11
4	Student	0	0.00	1	7.14	0	0.00	0	0.00	0	0.00	1	2.70
Total		7	100.00	16	100.00	10	100.00	5	100.00	1	100.00	37	100.00

Table 6: Occupation of family members in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (28)		MF (69)		SF (41)		SMF (26)		MDF (4)		All (168)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Agriculture	0	0.00	16	23.19	23	56.10	15	57.69	0	0.00	54	32.14
2	Agricultural Labour	14	50.00	28	40.58	3	7.32	3	11.54	2	50.00	50	29.76
3	General Labour	8	28.57	1	1.45	0	0.00	0	0.00	0	0.00	9	5.36
6	Government Service	0	0.00	1	1.45	0	0.00	0	0.00	0	0.00	1	0.60
5	Private Service	0	0.00	4	5.80	1	2.44	1	3.85	0	0.00	6	3.57
6	Student	4	14.29	17	24.64	13	31.71	7	26.92	2	50.00	43	25.60
7	Housewife	0	0.00	1	1.45	1	2.44	0	0.00	0	0.00	2	1.19
8	Children	2	7.14	1	1.45	0	0.00	0	0.00	0	0.00	3	1.79
Total		28	100.00	69	100.00	41	100.00	26	100.00	4	100.00	168	100.00

Occupation of the household members: The data regarding the occupation of the household members in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 6. The results indicate that agriculture was the major occupation for 32.14 per cent of the household members, 29.76 per cent were agricultural laborers, 5.36 per cent were general labourers, 0.60 per cent were in government service, 3.57 per cent were in private service, 25.60 per cent were students, 1.19 per cent were housewives and 1.79 per cent were children.

Institutional participation of the household members: The results (Table 7) show that 100 per cent of the population in the micro watershed has not participated in any local institutions.

Table7. Institutional Participation of household members in Haligeri-2 & Haligeri-3 micro-watershed

Sl. No.	Particulars	LL (28)		MF (69)		SF (41)		SMF (26)		MDF (4)		All (168)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	No Participation	28	100	69	100	41	100	26	100	4	100	168	100
Total		28	100	69	100	41	100	26	100	4	100	168	100

Type of house owned: The data regarding the type of house owned by the households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 8. The results indicate that 2.70 per cent of the households possess thatched house, 86.49 per cent of the households possess katcha house and 10.81 per cent of them possess pucca house.

Table 8. Type of house owned by households in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Thatched	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.70
2	Katcha	5	71.43	12	85.71	9	90.00	5	100.00	1	100.00	32	86.49
3	Pucca/RCC	1	14.29	2	14.29	1	10.00	0	0.00	0	0.00	4	10.81
Total		7	100.00	14	100.00	10	100.00	5	100.00	1	100.00	37	100.00

Durable Assets owned by the households: The results (Table 9)show that 62.16 per cent of the households possess TV, 54.05 per cent of the households possess mixer/grinder, 8.11 per cent of the households possess bicycle, 18.92 per cent of the households possess motor cycle, and 97.30 per cent of the households possess mobile phones.

Table 9. Durable Assets owned by the households in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Television	3	42.86	10	71.43	7	70.00	3	60.00	0	0.00	23	62.16
2	Mixer/Grinder	2	28.57	7	50.00	8	80.00	3	60.00	0	0.00	20	54.05
3	Bicycle	0	0.00	0	0.00	2	20.00	1	20.00	0	0.00	3	8.11
4	Motor Cycle	0	0.00	5	35.71	1	10.00	1	20.00	0	0.00	7	18.92
5	Mobile Phone	6	85.71	14	100.00	10	100.00	5	100.00	1	100.00	36	97.30
6	Blank	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.70

Average value of durable assets: The data regarding the average value of durable assets owned by the households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 10. The results show that the average value of television was Rs. 8,782, mixer/grinder was Rs.2,075, bivycle was Rs. 11,166, motor cycle was Rs. 34,000 and mobile phone was Rs. 2,807.

Table 10. Average value of durable assets owned by households in Haligeri-2 & Haligeri-3 micro-watershed

Average value (Rs.)

Sl.No.	Particulars	LL (7)	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Television	9,000.00	8,900.00	8,428.00	9,000.00	0.00	8,782.00
2	Mixer/Grinder	2,000.00	2,000.00	2,125.00	2,166.00	0.00	2,075.00
3	Bicycle	0.00	0.00	1,750.00	30,000.00	0.00	11,166.00
4	Motor Cycle	0.00	40,000.00	3,000.00	35,000.00	0.00	34,000.00
5	Mobile Phone	3,083.00	3,066.00	2,320.00	2,666.00	3,000.00	2,807.00

Farm Implements owned: The data regarding the farm implements owned by the households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 11. About 2.70 per cent of the households possess bullock cart, 18.92 per cent of the households possess plough, 56.76 per cent of them weeder and 8.11 per cent of them possess chaff cutter.

Table 11. Farm Implements owned by households in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock Cart	0	0.00	1	7.14	0	0.00	0	0.00	0	0.00	1	2.70
2	Plough	0	0.00	5	35.71	2	20.00	0	0.00	0	0.00	7	18.92
3	Weeder	1	14.29	7	50.00	7	70.00	5	100.00	1	100.00	21	56.76
4	Chaff Cutter	0	0.00	2	14.29	0	0.00	1	20.00	0	0.00	3	8.11
5	Blank	6	85.71	4	28.57	3	30.00	0	0.00	0	0.00	13	35.14

Average value of farm implements: The data regarding the average value of farm Implements owned by the households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 12. The results show that the average value of bullock cart was Rs. 21,000, plough was Rs.1,000, average value of weeder was Rs.48 and chaff cutter was Rs. 266.

Table 12. Average value of farm implements owned by households in Haligeri-2 & Haligeri-3 micro-watershed

Average Value (Rs.)

Sl.No.	Particulars	LL (7)	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Bullock Cart	0.00	21,000.00	0.00	0.00	0.00	21,000.00
2	Plough	0.00	833.00	1,750.00	0.00	0.00	1,000.00
3	Weeder	60.00	45.00	50.00	47.00	50.00	48.00
4	Chaff Cutter	0.00	150.00	0.00	500.00	0.00	266.00

Livestock possession by the households: The data regarding the Livestock possession by the households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 13. The results indicate that, 24.32 per cent of the households possess bullocks, 16.22 per

cent of the households possess local cow and 2.70 per cent of them possess crossbreed cow and sheep.

Table 13. Livestock possession by households in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Bullock	0	0.00	5	35.71	4	40.00	0	0.00	0	0.00	9	24.32
2	Local cow	0	0.00	2	14.29	0	0.00	3	60.00	1	100.00	6	16.22
3	Crossbreed cow	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.70
4	Sheep	1	14.29	0	0.00	0	0.00	0	0.00	0	0.00	1	2.70
5	blank	6	85.71	8	57.14	6	60.00	2	40.00	0	0.00	22	59.46

Average Labour availability: The data regarding the average labour availability in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 14. The results indicate that, average own labour men available in the micro watershed was 1.76, average own labour (women) available was 1.24, average hired labour (men) available was 6.06 and average hired labour (women) available was 5.73.

Table 14. Average Labour availability in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Hired labour Female	4.86	5.60	9.00	5.00	5.73
2	Own Labour Female	1.36	1.00	1.60	1.00	1.24
3	Own labour Male	1.93	1.20	2.40	1.00	1.76
4	Hired labour Male	4.93	6.10	9.00	5.00	6.06

Adequacy of Hired Labour: The data regarding the adequacy of hired labour in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 15. The results indicate that, 86.49 per cent of the households opined that the hired labour was adequate.

Table 15. Adequacy of Hired Labour in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate	3	42.86	14	100.00	9	90.00	5	100.00	1	100.00	32	86.49

Table 16. Distribution of land (Ha) in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		ha	%	ha	%	ha	%	ha	%	ha	%
1	Dry	6.41	87.81	10.64	88.85	11.33	100.00	0.00	0.00	28.39	83.86
2	Irrigated	0.89	12.19	1.34	11.15	0.00	0.00	3.24	100.00	5.46	16.14
Total		7.30	100.00	11.98	100.00	11.33	100.00	3.24	100.00	33.85	100.00

Distribution of land (ha): The data regarding the distribution of land (ha) in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 16. The results indicate that, households of the Haligeri-2 & Haligeri-3 micro-watershed possess 28.39 ha (83.86%) of dry land and 5.46 ha (16.14%) of irrigated land. Marginal farmers possess 6.341 ha (87.81%) of dry land and 0.89 ha (12.19%) of irrigated land. Small farmers possess 10.64 ha (88.85%) of dry land and 1.34 ha (11.15%) of irrigated land. Semi medium farmers

possess 11.33 ha (100.00%) of dry land. Medium farmers possess 3.24 ha (68.17%) of irrigated land.

Average land value (Rs./ha): The data regarding the average land value (Rs./ha) in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 17. The results indicate that, the average value of dry land was Rs. 417,241.63 and average value of irrigated land was Rs. 402,518.52. In case of marginal famers, the average land value was Rs. 771,388.01 for dry land and Rs. 1,234,999.97 for irrigated land. In case of small famers, the average land value was Rs. 328,707.23 for dry land and Rs. 523,939.40 for irrigated land. In case of semi medium famers, the average land value was Rs. 299,928.57 for dry land. In case of medium farmers, the average land value was Rs. 123,500.00 for irrigated land.

Table 17. Average land value (Rs./ha) in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Dry	771,388.01	328,707.23	299,928.57	0.00	417,241.63
2	Irrigated	1,234,999.97	523,939.40	0.00	123,500.00	402,518.52

Status of bore wells: The data regarding the status of bore wells in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 18. The results indicate that, there were 5 functioning bore wells in the micro watershed.

Table 18. Status of bore wells in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
		N	N	N	N	N
1	Functioning	2	2	0	1	5

Source of irrigation: The data regarding the source of irrigation in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 19. The results indicate that, bore well was the major irrigation source in the micro water shed for 13.51 per cent of the farmers.

Table 19. Source of irrigation in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Bore Well	2	14.29	2	20.00	0	0.00	1	100.00	5	13.51

Depth of water (Avg in meters): The data regarding the depth of water in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 20. The results indicate that, the depth of bore well was found to be 14.42 meters.

Table 20. Depth of water (Avg in meters) in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)	SF (10)	MDF (1)	All (37)
1	Bore Well	15.24	21.34	106.68	14.42

Irrigated Area (ha): The data regarding the irrigated area (ha) in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 21. The results indicate that, marginal, small and medium farmers had an irrigated area of 0.91 ha, 1.34 ha and 3.24 ha respectively.

Table 21. Irrigated Area (ha) in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)	SF (10)	MDF (1)	All (37)
1	Kharif	0.91	1.34	3.24	5.49
Total		0.91	1.34	3.24	5.49

Cropping pattern: The data regarding the cropping pattern in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 22. The results indicate that, farmers have grown bajra (2.64 ha), Bengal gram (0.81 ha), cotton (2.43 ha), green gram (1.26 ha), groundnut (4.53 ha), maize (15.96 ha) and sorghum (5.83 ha). Marginal farmers have grown bajra, Bengal gram, groundnut, maize and sunflower. Small farmers had grown bajra, cotton, greengram, groundnut, maize and sunflower. Semi medium farmers had grown groundnut, maize and sunflower. Medium farmers had grown maize.

Table 22. Cropping pattern in Haligeri-2 & Haligeri-3 micro-watershed (Area in ha)

Sl.No.	Particulars	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Kharif - Bajra	0.50	2.15	0.00	0.00	2.64
2	Kharif - Bengal gram	0.81	0.00	0.00	0.00	0.81
3	Kharif - Cotton	0.00	2.43	0.00	0.00	2.43
4	Kharif – Green gram	0.00	1.26	0.00	0.00	1.26
5	Kharif - Groundnut	0.81	1.70	2.02	0.00	4.53
6	Kharif - Maize	3.00	2.43	7.29	3.24	15.96
7	Kharif - Sunflower	1.78	2.02	2.02	0.00	5.83
Total		7.31	11.98	11.34	3.24	33.87

Cropping intensity: The data regarding the cropping intensity in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 23. The results indicate that, the cropping intensity in Haligeri-2 & Haligeri-3 micro-watershed was found to be 99.93 per cent.

Table 23. Cropping intensity (%) in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)	MF (14)	SF (10)	SMF (5)	MDF (1)	LF (0)	All (37)
1	Cropping Intensity	0.00	99.67	100.00	100.00	100.00	0.00	99.93

Possession of Bank account and savings: The results (Table 24) indicate that, 2.70 per cent of the households have bank account and savings**.**

Table 24. Possession of Bank account and savings in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		LF (0)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Account	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	1	2.70
2	Savings	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	1	2.70

Table 25. Borrowing status in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		LF (0)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%	N	%
1	Credit Availed	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	0	0.00	1	2.70

Borrowing status: The data regarding the borrowing status in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 25. The results indicate that, 2.70 per cent of the households have availed credit from different sources.

Cost of Cultivation of Bajra: The data regarding the cost of cultivation of bajra in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 26. The results indicate that, the total cost of cultivation for bajra was Rs. 79762.40. The gross income realized by the farmers was Rs. 59035.76. The net income from bajra cultivation was Rs. -20726.64, thus the benefit cost ratio was found to be 1:0.74.

Table 26. Cost of Cultivation of Bajra in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	70.93	14281.69	17.91
2	Bullock		Pairs/day	12.35	7410.00	9.29
3	Tractor		Hours	3.23	2260.76	2.83
4	Machinery		Hours	0.62	432.25	0.54
5	Seed Main Crop (Establishment and maintenance)		Kgs (Rs.)	13.80	1693.68	2.12
7	FYM		Quintal	12.97	3087.50	3.87
8	Fertilizer + micronutrients		Quintal	16.97	13164.29	16.50
9	Pesticides (PPC)		Kgs / liters	0.00	0.00	0.00
10	Irrigation		Number	7.60	0.00	0.00
11	Repairs			0.00	0.00	0.00
13	Depreciation charges			0.00	1.01	0.00
14	Land revenue and Taxes			0.00	3.29	0.00
II	**Cost B1**					
16	Interest on working capital				2153.58	2.70
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				44488.05	55.78
III	**Cost B2**					
18	Rental Value of Land				500.00	0.63
19	**Cost B2 = (Cost B1 + Rental value)**				44988.05	56.40
IV	**Cost C1**					
20	Family Human Labour			131.52	27522.22	34.51
21	**Cost C1 = (Cost B2 + Family Labour)**				72510.27	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				72511.27	90.91
VI	**Cost C3**					
24	Managerial Cost				7251.13	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				79762.40	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		52.64	57904.92	
		b) Main Crop Sales Price (Rs.)			1100.00	
	By Product	e) Main Product (q)		1.51	1130.83	
		f) Main Crop Sales Price (Rs.)			750.00	
b.	Gross Income (Rs.)				59035.76	
c.	Net Income (Rs.)				-20726.64	
d.	Cost per Quintal (Rs./q.)				1515.22	
e.	Benefit Cost Ratio (BC Ratio)				1:0.74	

Cost of Cultivation of Bengal gram: The data regarding the cost of cultivation of bengal gram in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 27. The results indicate that, the total cost of cultivation for bengal gram was Rs. 60725.87. The gross income realized by the farmers was Rs. 93860.00. The net income from bengal gram cultivation was Rs. 33134.13, thus the benefit cost ratio was found to be 1:1.55.

Table 27. Cost of Cultivation of Bengal gram in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars		Units	PhyUnits	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	22.23	3828.50	6.30
2	Bullock		Pairs/day	1.24	741.00	1.22
3	Tractor		Hours	9.88	6916.00	11.39
4	Machinery		Hours	4.94	3458.00	5.69
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	123.50	18525.00	30.51
6	Seed Inter Crop		Kgs.	0.00	0.00	0.00
7	FYM		Quintal	2.47	494.00	0.81
8	Fertilizer + micronutrients		Quintal	7.41	6125.60	10.09
9	Pesticides (PPC)		Kgs /liters	1.24	1235.00	2.03
10	Irrigation		Number	0.00	0.00	0.00
11	Repairs			0.00	0.00	0.00
13	Depreciation charges			0.00	4.94	0.01
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				3165.67	5.21
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				44497.01	73.28
III	**Cost B2**					
18	Rental Value of Land				333.33	0.55
19	**Cost B2 = (Cost B1 + Rental value)**				44830.34	73.82
IV	**Cost C1**					
20	Family Human Labour			59.28	10374.00	17.08
21	**Cost C1 = (Cost B2 + Family Labour)**				55204.34	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				55205.34	90.91
VI	**Cost C3**					
24	Managerial Cost				5520.53	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				60725.87	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		19.76	88920.00	
		b) Main Crop Sales Price (Rs.)			4500.00	
	By Product	e) Main Product (q)		2.47	4940.00	
		f) Main Crop Sales Price (Rs.)			2000.00	
b.	Gross Income (Rs.)				93860.00	
c.	Net Income (Rs.)				33134.13	
d.	Cost per Quintal (Rs./q.)				3073.17	
e.	Benefit Cost Ratio (BC Ratio)				1:1.55	

Cost of Cultivation of Green gram: The data regarding the cost of cultivation of green gram in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 28. The results indicate that, the total cost of cultivation for green gram was Rs. 22926.41. The gross income realized by the farmers was Rs. 39838.71. The net income from Green gram cultivation was Rs. 16912.30, thus the benefit cost ratio was found to be 1:1.74.

Table 28. Cost of Cultivation of green gram in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	37.45	7856.19	34.27
2	Bullock	Pairs/day	0.00	0.00	0.00
3	Tractor	Hours	2.39	1673.23	7.30
4	Machinery	Hours	0.00	0.00	0.00
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	14.34	2007.87	8.76
7	FYM	Quintal	0.00	0.00	0.00
8	Fertilizer + micronutrients	Quintal	4.78	3952.00	17.24
9	Pesticides (PPC)	Kgs / liters	0.80	796.77	3.48
10	Irrigation	Number	0.00	0.00	0.00
11	Repairs		0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)		0.00	0.00	0.00
13	Depreciation charges		0.00	0.02	0.00
14	Land revenue and Taxes		0.00	3.29	0.01
II	**Cost B1**				
16	Interest on working capital			810.92	3.54
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			17100.29	74.59
III	**Cost B2**				
18	Rental Value of Land			1000.00	4.36
19	**Cost B2 = (Cost B1 + Rental value)**			18100.29	78.95
IV	**Cost C1**				
20	Family Human Labour		12.75	2740.90	11.96
21	**Cost C1 = (Cost B2 + Family Labour)**			20841.20	90.90
V	**Cost C2**				
22	Risk Premium			1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**			20842.20	90.91
VI	**Cost C3**				
24	Managerial Cost			2084.22	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			22926.41	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	7.97	39838.71	
		b) Main Crop Sales price (Rs.)		5000.00	
b.	Gross Income (Rs.)			39838.71	
c.	Net Income (Rs.)			16912.30	
d.	Cost per Quintal (Rs./q.)			2877.40	
e.	Benefit Cost Ratio (BC Ratio)			1:1.74	

Cost of Cultivation of Groundnut: The data regarding the cost of cultivation of groundnut in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 29. The results indicate that, the total cost of cultivation for groundnut was Rs. 40061.50. The gross income realized by the farmers was Rs. 28619.46. The net income from groundnut cultivation was Rs. -11442.04. Thus the benefit cost ratio was found to be 1:0.71.

Table 29. Cost of Cultivation of Groundnut in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars		Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**					
1	Hired Human Labour		Man days	40.88	7037.70	17.57
2	Bullock		Pairs/day	1.18	710.42	1.77
3	Tractor		Hours	3.32	2453.53	6.12
4	Machinery		Hours	0.20	137.22	0.34
5	Seed Main Crop (Establishment and Maintenance)		Kgs (Rs.)	113.31	16995.95	42.42
7	FYM		Quintal	1.76	352.86	0.88
8	Fertilizer + micronutrients		Quintal	3.60	3572.72	8.92
9	Pesticides (PPC)		Kgs / liters	0.77	772.37	1.93
10	Irrigation		Number	0.49	0.00	0.00
11	Repairs			0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)			0.00	0.00	0.00
13	Depreciation charges			0.00	8.15	0.02
14	Land revenue and Taxes			0.00	3.29	0.01
II	**Cost B1**					
16	Interest on working capital				2603.39	6.50
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**				34647.59	86.49
III	**Cost B2**					
18	Rental Value of Land				333.33	0.83
19	**Cost B2 = (Cost B1 + Rental value)**				34980.92	87.32
IV	**Cost C1**					
20	Family Human Labour			8.32	1437.62	3.59
21	**Cost C1 = (Cost B2 + Family Labour)**				36418.54	90.91
V	**Cost C2**					
22	Risk Premium				1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**				36419.54	90.91
VI	**Cost C3**					
24	Managerial Cost				3641.95	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**				40061.50	100.00
VII	**Economics of the Crop**					
a.	Main Product	a) Main Product (q)		6.37	28156.04	
		b) Main Crop Sales Price (Rs.)			4416.67	
	By Product	e) Main Product (q)		0.77	463.42	
		f) Main Crop Sales Price (Rs.)			600.00	
b.	Gross Income (Rs.)				28619.46	
c.	Net Income (Rs.)				-11442.04	
d.	Cost per Quintal (Rs./q.)				6284.20	
e.	Benefit Cost Ratio (BC Ratio)				1:0.71	

Cost of Cultivation of Maize: The data regarding the cost of cultivation of maize in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 30. The results indicate that, the total cost of cultivation for maize was Rs. 50934.85. The gross income realized by the farmers was Rs. 58580.03. The net income from maize cultivation was Rs.7645.18. Thus the benefit cost ratio was found to be 1:1.15.

Table 30. Cost of Cultivation of maize in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	50.19	7203.11	14.14
2	Bullock	Pairs/day	8.63	5461.43	10.72
3	Tractor	Hours	4.34	3110.62	6.11
4	Machinery	Hours	1.46	1035.14	2.03
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	28.55	3426.04	6.73
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	4.65	929.37	1.82
8	Fertilizer + micronutrients	Quintal	9.70	7791.24	15.30
9	Pesticides (PPC)	Kgs / liters	1.32	1321.77	2.60
10	Irrigation	Number	0.00	0.00	0.00
11	Repairs		0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)		0.00	0.00	0.00
13	Depreciation charges		0.00	444.60	0.87
14	Land revenue and Taxes		0.00	3.29	0.01
II	**Cost B1**				
16	Interest on working capital			1616.33	3.17
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			32342.94	63.50
III	**Cost B2**				
18	Rental Value of Land			307.69	0.60
19	**Cost B2 = (Cost B1 + Rental value)**			32650.63	64.10
IV	**Cost C1**				
20	Family Human Labour		74.18	13652.78	26.80
21	**Cost C1 = (Cost B2 + Family Labour)**			46303.41	90.91
V	**Cost C2**				
22	Risk Premium			1.00	0.00
23	**Cost C2 = (Cost C1 + Risk Premium)**			46304.41	90.91
VI	**Cost C3**				
24	Managerial Cost			4630.44	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			50934.85	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	44.19	53029.80	
		b) Main Crop Sales Price (Rs.)		1200.00	
	By Product	e) Main Product (q)	3.80	5550.23	
		f) Main Crop Sales Price (Rs.)		1461.54	
b.	Gross Income (Rs.)			58580.03	
c.	Net Income (Rs.)			7645.18	
d.	Cost per Quintal (Rs./q.)			1152.59	
e.	Benefit Cost Ratio (BC Ratio)			1:1.15	

Cost of cultivation of Sunflower: The data regarding the cost of cultivation of Sunflower in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 31. The results indicate that, the total cost of cultivation for sunflower was Rs. 37226.95. The gross income realized by the farmers was Rs. 58951.17. The net income from sunflower cultivation was Rs. 21724.22. Thus the benefit cost ratio was found to be 1:1.58.

Table 31. Cost of Cultivation of Sunflower in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No	Particulars	Units	Phy Units	Value(Rs.)	% to C3
I	**Cost A1**				
1	Hired Human Labour	Man days	25.26	4972.53	13.36
2	Bullock	Pairs/day	3.27	1933.59	5.19
3	Tractor	Hours	2.22	1576.68	4.24
4	Machinery	Hours	1.99	1379.08	3.70
5	Seed Main Crop (Establishment and Maintenance)	Kgs (Rs.)	9.80	4654.02	12.50
6	Seed Inter Crop	Kgs.	0.00	0.00	0.00
7	FYM	Quintal	3.66	732.02	1.97
8	Fertilizer + micronutrients	Quintal	6.55	5999.43	16.12
9	Pesticides (PPC)	Kgs/liters	1.15	1105.51	2.97
10	Irrigation	Number	4.73	0.00	0.00
11	Repairs		0.00	0.00	0.00
12	Msc. Charges (Marketing costs etc)		0.00	0.00	0.00
13	Depreciation charges		0.00	27.42	0.07
14	Land revenue and Taxes		0.00	2.74	0.01
II	**Cost B1**				
16	Interest on working capital			1499.22	4.03
17	**Cost B1 = (Cost A1 + sum of 15 and 16)**			23882.25	64.15
III	**Cost B2**				
18	Rental Value of Land			305.56	0.82
19	**Cost B2 = (Cost B1 + Rental value)**			24187.81	64.97
IV	**Cost C1**				
20	Family Human Labour		47.54	9652.37	25.93
21	**Cost C1 = (Cost B2 + Family Labour)**			33840.18	90.90
V	**Cost C2**				
22	Risk Premium			2.50	0.01
23	**Cost C2 = (Cost C1 + Risk Premium)**			33842.68	90.91
VI	**Cost C3**				
24	Managerial Cost			3384.27	9.09
25	**Cost C3 = (Cost C2 + Managerial Cost)**			37226.95	100.00
VII	**Economics of the Crop**				
a.	Main Product	a) Main Product (q)	14.26	58951.17	
		b) Main Crop Sales Price (Rs.)		4133.33	
b.	Gross Income (Rs.)			58951.17	
c.	Net Income (Rs.)			21724.22	
d.	Cost per Quintal (Rs./q.)			2610.15	
e.	Benefit Cost Ratio (BC Ratio)			1:1.58	

Adequacy of fodder: The data regarding the adequacy of fodder in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 32. The results indicate that, 37.84 per cent of the households opined that dry fodder was adequate and 43.24 per cent of the households opined that green fodder was adequate.

Table 32. Adequacy of fodder in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Adequate-Dry Fodder	1	14.29	5	35.71	4	40.00	3	60.00	1	100.00	14	37.84
2	Adequate-Green Fodder	1	14.29	7	50.00	4	40.00	3	60.00	1	100.00	16	43.24

Annual gross income: The data regarding the annual gross income in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 33. The results indicate that the annual gross income was Rs. 52,857.14 for landless farmers, for marginal farmers it was Rs. 79,121.43, for small farmers it was Rs. 88,395, for semi medium farmers it was Rs. 118,570 and for medium farmers it was Rs. 75,000.

Table 33. Annual gross income in Haligeri-2 & Haligeri-3 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (7)	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Wage	51,428.57	44,285.71	31,500.00	37,000.00	50,000.00	41,351.35
2	Agriculture	0.00	33,764.29	56,895.00	79,570.00	25,000.00	39,581.08
3	Dairy Farm	1,428.57	1,071.43	0.00	2,000.00	0.00	945.95
Income(Rs.)		52,857.14	79,121.43	88,395.00	118,570.00	75,000.00	81,878.38

Average annual expenditure: The data regarding the average annual expenditure in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 34. The results indicate that the average annual expenditure is Rs. 7,554.34. For landless households it was Rs. 6,020.41, for marginal farmers it was Rs. 3,974.49, for small farmers it was Rs. 5,572.50, for semi medium farmers it was Rs. 16,000 and for medium farmers it was Rs. 46,000.

Table 34. Average annual expenditure in Haligeri-2 & Haligeri-3 micro-watershed

(Avg value in Rs.)

Sl.No.	Particulars	LL (7)	MF (14)	SF (10)	SMF (5)	MDF (1)	All (37)
1	Wage	37,142.86	29,642.86	23,625.00	22,000.00	28,000.00	27,081.08
2	Agriculture	0.00	19,000.00	32,100.00	53,000.00	18,000.00	23,513.51
3	Dairy Farm	5,000.00	7,000.00	0.00	5,000.00	0.00	459.46
Total		42,142.86	55,642.86	55,725.00	80,000.00	46,000.00	279,510.71
Average		6,020.41	3,974.49	5,572.50	16,000.00	46,000.00	7,554.34

Table35. Horticulture species grown in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		F	B	F	B	F	B	F	B	F	B
1	Coconut	16	1	10	0	54	0	0	0	80	1
2	Mango	0	0	1	0	0	0	0	0	1	0

***F= Field B=Back Yard**

Horticulture species grown: The data regarding horticulture species grown in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 35. The results indicate that, sampled

households have grown 80 coconut tree and 1 mango trees in the field. Also, 1 coconut tree in the backyard.

Forest species grown: The data regarding forest species grown in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 36. The results indicate that, households have planted 16 teak and 65 neem trees in their field.

Table 36: Forest species grown in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		F	B	F	B	F	B	F	B	F	B
1	Teak	1	0	15	0	0	0	0	0	16	0
2	Neem	14	0	24	0	12	0	15	0	65	0

***F= Field B=Back Yard**

Marketing of the agricultural produce: The data regarding marketing of the agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 37. The results indicated that, bajra was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 93.75 per cent and cotton, green gram, groundnut, maize, and sunflower was sold to the extent of 100 per cent.

Table 37. Marketing of the agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed

Sl. No	Crops	Output obtained (q)	Output retained (q)	Output sold (q)	Output sold (%)	Avg. Price obtained (Rs/q)
1	Bajra	77.0	0.0	77.0	100.0	1100.0
2	Bengal gram	16.0	1.0	15.0	93.75	4500.0
3	Cotton	36.0	0.0	36.0	100.0	4500.0
4	Green gram	10.0	0.0	10.0	100.0	5000.0
5	Groundnut	28.0	0.0	28.0	100.0	4416.67
6	Maize	511.0	0.0	511.0	100.0	1200.0
7	Sunflower	75.0	0.0	75.0	100.0	4133.33

Marketing Channels used for sale of agricultural produce: The data regarding marketing channels used for sale of agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 38. The results indicated that, about 78.38 per cent of the farmers sold their produce to local/village merchants and 2.70 per cent of their produce to regulated markets.

Table 38. Marketing Channels used for sale of agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Local/village Merchant	14	100.00	9	90.00	5	100.00	1	100.0	29	78.38
2	Regulated Market	0	0.00	1	10.00	0	0.00	0	0.00	1	2.70

Table 39. Mode of transport of agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Tractor	14	100.00	10	100.00	5	100.00	1	100.00	30	81.08

Mode of transport of agricultural produce: The data regarding mode of transport of agricultural produce in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 39. The results indicated that, 81.08 per cent of the households have used tractor as a mode of transportation for their agricultural produce.

Incidence of soil and water erosion problems: The data regarding incidence of soil and water erosion problems in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 40. The results indicated that, 62.16 per cent of the households have experienced soil and water erosion problems in the farm.

Table 40. Incidence of soil and water erosion problems in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF(5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Soil and water erosion problems in the farm	12	85.71	6	60.00	4	80.00	1	100.00	23	62.16

Interest shown towards soil testing: The data regarding Interest shown towards soil testing in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 41. The results indicated that, 78.38 per cent have shown interest in soil test.

Table 41. Interest shown towards soil testing in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Interest in soil test	14	100.00	9	90.00	5	100.00	1	100.00	29	78.38

Usage pattern of fuel for domestic use: The data regarding usage pattern of fuel for domestic use in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 42. The results indicated that, 83.72 per cent of the households used firewood and 16.22 per cent used LPG as a source of fuel.

Table42. Usage pattern of fuel for domestic use in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Fire Wood	6	85.71	11	78.57	9	90.00	4	80.00	1	100.00	31	83.78
2	LPG	1	14.29	3	21.43	1	10.00	1	20.00	0	0.00	6	16.22

Table43. Source of drinking water for domestic use in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Piped supply	6	85.71	14	100.00	8	80.00	4	80.00	1	100.00	33	89.19
2	Bore Well	0	0.00	0	0.00	1	10.00	1	20.00	0	0.00	2	5.41
3	Lake/ Tank	1	14.29	0	0.00	1	10.00	0	0.00	0	0.00	2	5.41

Source of drinking water: The data regarding source of drinking water in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 43. The results indicated that, piped supply was the major source of drinking water for 89.19 per cent and bore well and

lake/tank was the source of drinking water for 5.41 per cent of the households in the micro watershed.

Source of light: The data regarding source of light in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 44. The results indicated that, Electricity was the major source of light for 100 per cent of the households in micro watershed.

Table 44. Source of light in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Electricity	7	100.00	14	100.00	10	100.00	5	100.00	1	100.00	38	100.00

Existence of Sanitary toilet facility: The data regarding existence of sanitary toilet facilit**y** in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 45. The results indicated that, 54.05 per cent of the households possess sanitary toilet.

Table 45. Existence of Sanitary toilet facility in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Sanitary toilet facility	4	57.14	10	71.43	2	20.00	3	60.00	1	100.00	20	54.05

Possession of PDS card: The data regarding possession of PDS card in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 46. The results indicated that, 97.30 per cent of the sampled households possessed BPL card and 5.41 per cent of the sampled households did not possess BPL card.

Table 46. Possession of PDS card in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	BPL	8	114.29	13	92.86	10	100.00	4	80.00	1	100.00	36	97.30
2	Not Possessed	0	0.00	1	7.14	0	0.00	1	20.00	0	0.00	2	5.41

Participation in NREGA program: The data regarding participation in NREGA programme in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 47. The results indicated that, 24.32 per cent of the households participated in NREGA programme.

Table 47. Participation in NREGA programme in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Participation in NREGA programme	4	57.14	2	14.29	1	10.00	1	20.00	1	100.00	9	24.32

Adequacy of food items: The data regarding adequacy of food items in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 48. The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 91.89 per cent, vegetables and fruits were adequate for 5.41 per cent, milk and meat was adequate for 97.30 per cent and eggs were adequate for 94.59 per cent.

Table 48. Adequacy of food items in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
1	Cereals	7	100.00	14	100.00	10	100.00	5	100.00	1	100.00	37	100.00
2	Pulses	6	85.71	13	92.86	9	90.00	5	100.00	1	100.00	34	91.89
3	Vegetables	1	14.29	0	0.00	0	0.00	1	20.00	0	0.00	2	5.41
4	Fruits	1	14.29	1	7.14	0	0.00	0	0.00	0	0.00	2	5.41
5	Milk	7	100.00	14	100.00	9	90.00	5	100.00	1	100.00	36	97.30
6	Egg	7	100.00	13	92.86	9	90.00	5	100.00	1	100.00	35	94.59
7	Meat	7	100.00	14	100.00	9	90.00	5	100.00	1	100.00	36	97.30

Response on Inadequacy of food items: The data regarding inadequacy of food items in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 49. The results indicated that, pulses were inadequate for 8.11 per cent, oilseed were inadequate for 97.30 per cent, vegetables and fruits were inadequate for 94.59 per cent, milk and eggs were inadequate for 2.70 per cent of the households.

Table 49. Response on Inadequacy of food items in Haligeri-2 & Haligeri-3 micro-watershed

Sl.No.	Particulars	LL (7)		MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%	N	%
2	Pulses	1	14.29	1	7.14	1	10.00	0	0.00	0	0.00	3	8.11
3	Oilseed	7	100.00	14	100.00	9	90.00	5	100.00	1	100.00	36	97.30
4	Vegetables	6	85.71	14	100.00	10	100.00	4	80.00	1	100.00	35	94.59
5	Fruits	6	85.71	13	92.86	10	100.00	5	100.00	1	100.00	35	94.59
6	Milk	0	0.00	0	0.00	1	10.00	0	0.00	0	0.00	1	2.70
7	Egg	0	0.00	1	7.14	0	0.00	0	0.00	0	0.00	1	2.70

Farming constraints: The data regarding farming constraints experienced by households in Haligeri-2 & Haligeri-3 micro-watershed is presented in Table 50. The results indicated that, lower fertility status of the soil was the constraint experienced by 81.08 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases, inadequacy of irrigation water, high cost of fertilizers and plant protection chemicals was the constraint experienced by 78.38 per cent of the households, high rate of interest on credit (62.16%), low price for the agricultural commodities (56.76%), lack of marketing facilities in the area (29.73%), inadequate extension services (18.92%), lack of transport for the safe transport of agricultural produce to the market (10.81 %) and source of agri technology information (2.70 %).

Table 50. Farming constraints Experienced in Haligeri-2 & Haligeri-3 micro-watershed

Sl. No.	Particulars	MF (14)		SF (10)		SMF (5)		MDF (1)		All (37)	
		N	%	N	%	N	%	N	%	N	%
1	Lower fertility status of the soil	14	100.00	10	100.00	5	100.00	1	100.00	30	81.08
2	Wild animal menace on farm field	13	92.86	10	100.00	5	100.00	1	100.00	29	78.38
3	Frequent incidence of pest and diseases	14	100.00	9	90.00	5	100.00	1	100.00	29	78.38
4	Inadequacy of irrigation water	14	100.00	9	90.00	5	100.00	1	100.00	29	78.38
5	High cost of Fertilizers and plant protection chemicals	14	100.00	9	90.00	5	100.00	1	100.00	29	78.38
6	High rate of interest on credit	11	78.57	8	80.00	3	60.00	1	100.00	23	62.16
7	Low price for the agricultural commodities	10	71.43	8	80.00	2	40.00	1	100.00	21	56.76
8	Lack of marketing facilities in the area	5	35.71	5	50.00	0	0.00	1	100.00	11	29.73
9	Inadequate extension services	2	14.29	5	50.00	0	0.00	0	0.00	7	18.92
10	Lack of transport for safe transport of the Agril produce to the market.	0	0.00	4	40.00	0	0.00	0	0.00	4	10.81
11	Source of Agri-technology information(Newspaper/TV/Mobile)	0	0.00	1	10.00	0	0.00	0	0.00	1	2.70

Chapter 5

SUMMARY

In order to assess the socio-economic condition of the farmers in the watershed a comprehensive questionnaire was prepared. Major components such as demographic conditions, migration details, food consumption and family expenditure pattern, material possession, land holding, land use management, cropping pattern, cost of cultivation of crops, livestock management. The statistical components such as frequency and percentage were used to analyse the data. About 37 households located in the micro watershed were interviewed for the survey.

The data indicated that there were 95 (56.55%) men and 73 (43.45%) women among the sampled households. The average family size of landless farmers' was 4, marginal farmers' was 4.92, small farmers' was 4.1, semi medium farmers' was 5.2 and medium farmers' was 4.

The data indicated that, 28 (16.67%) people were in 0-15 years of age, 73 (43.45%) were in 16-35 years of age, 46 (27.38%) were in 36-60 years of age and 21 (12.50%) were above 61 years of age.

The results indicated that Haligeri-2 & Haligeri-3 had 26.79 per cent illiterates, 1.19 per cent of them had functional illiterates, 24.40 per cent of them had primary school education, 4.76 per cent of them had middle school education, 21.43 per cent of them had high school education, 10.12 per cent of them had PUC education, 1.79 per cent of them had ITI, 5.95 per cent of them had degree education and 0.60 per cent did master's and Ph.D.

The results indicate that, 48.65 per cent of households were practicing agriculture, 45.95 per cent of the households were agricultural labourers, 8.11 per cent of the households were general labourers and 2.70 per cent of them were student. The results indicate that agriculture was the major occupation for 32.14 per cent of the household members, 29.76 per cent were agricultural labourers, 5.36 per cent were general labourers, 0.60 per cent were in government service, 3.57 per cent were in private service, 25.60 per cent were students, 1.19 per cent were housewives and 1.79 per cent were children.

The results show that 100 per cent of the population in the micro watershed has not participated in any local institutions.

The results indicate that 2.70 per cent of the households possess thatched house, 86.49 per cent of the households possess katcha house and 10.81 per cent of them possess pucca house.

The results show that 62.16 per cent of the households possess TV, 54.05 per cent of the households possess mixer/grinder, 8.11 per cent of the households possess bicycle, 18.92 per cent of the households possess motor cycle, and 97.30 per cent of the

households possess mobile phones. The results show that the average value of television was Rs. 8,782, mixer/grinder was Rs. 2,075, bicycle was Rs. 11,166, motor cycle was Rs. 34,000 and mobile phone was Rs. 2,807.

About 2.70 per cent of the households possess bullock cart, 18.92 per cent of the households possess plough, 56.76 per cent of them weeder and 8.11 per cent of them possess chaff cutter. The results show that the average value of bullock cart was Rs. 21,000, plough was Rs. 1,000, average value of weeder was Rs.48 and chaff cutter was Rs. 266.

The results indicate that, 24.32 per cent of the households possess bullocks, 16.22 per cent of the households possess local cow and 2.70 per cent of them possess crossbreed cow and sheep.

The results indicate that, average own labour men available in the micro watershed was 1.76, average own labour (women) available was 1.24, average hired labour (men) available was 6.06 and average hired labour (women) available was 5.73. The results indicate that, 86.49 per cent of the households opined that the hired labour was adequate.

The results indicate that, households of the Haligeri-2 & Haligeri-3 micro-watershed possess 28.39 ha (83.86%) of dry land and 5.46 ha (16.14%) of irrigated land. Marginal farmers possess 6.341 ha (87.81%) of dry land and 0.89 ha (12.19%) of irrigated land. Small farmers possess 10.64 ha (88.85%) of dry land and 1.34 ha (11.15%) of irrigated land. Semi medium farmers possess 11.33 ha (100.00%) of dry land. Medium farmers possess 3.24 ha (68.17%) of irrigated land.

The results indicate that, the average value of dry land was Rs. 417,241.63 and average value of irrigated land was Rs. 402,518.52. In case of marginal famers, the average land value was Rs. 771,388.01 for dry land and Rs. 1,234,999.97 for irrigated land. In case of small famers, the average land value was Rs. 328,707.23 for dry land and Rs. 523,939.40 for irrigated land. In case of semi medium famers, the average land value was Rs. 299,928.57 for dry land. In case of medium farmers, the average land value was Rs. 123,500.00 for irrigated land.

The results indicate that, there were 5 functioning bore wells in the micro watershed. The results indicate that, bore well was the major irrigation source in the micro water shed for 13.51 per cent of the farmers. The results indicate that, the depth of bore well was found to be 14.42 meters. The results indicate that, marginal, small and medium farmers had an irrigated area of 0.91 ha, 1.34 ha and 3.24 ha respectively.

The results indicate that, farmers have grown bajra (2.64 ha), Bengal gram (0.81 ha), cotton (2.43 ha), green gram (1.26 ha), groundnut (4.53 ha), maize (15.96 ha) and sorghum (5.83 ha). Marginal farmers have grown bajra, Bengal gram, groundnut, maize and sunflower. Small farmers had grown bajra, cotton, green gram, groundnut, maize and

sunflower. Semi medium farmers had grown groundnut, maize and sunflower. Medium farmers had grown maize. The results indicate that, the cropping intensity in Haligeri-2 & Haligeri-3 micro-watershed was found to be 99.93 per cent.

The results indicate that, 2.70 per cent of the households have bank account and savings. The results indicate that, 2.70 per cent of the households have availed credit from different sources.

The results indicate that, the total cost of cultivation for bajra was Rs. 79762.40. The gross income realized by the farmers was Rs. 59035.76. The net income from bajra cultivation was Rs. -20726.64, thus the benefit cost ratio was found to be 1:0.74. The results indicate that, the total cost of cultivation for bengal gram was Rs. 60725.87. The gross income realized by the farmers was Rs. 93860.00. The net income from bengal gram cultivation was Rs. 33134.13, thus the benefit cost ratio was found to be 1:1.55. The results indicate that, the total cost of cultivation for green gram was Rs. 22926.41. The gross income realized by the farmers was Rs. 39838.71. The net income from Green gram cultivation was Rs. 16912.30, thus the benefit cost ratio was found to be 1:1.74. The results indicate that, the total cost of cultivation for groundnut was Rs. 40061.50. The gross income realized by the farmers was Rs. 28619.46. The net income from groundnut cultivation was Rs. -11442.04. Thus the benefit cost ratio was found to be 1:0.71. The results indicate that, the total cost of cultivation for maize was Rs. 50934.85. The gross income realized by the farmers was Rs. 58580.03. The net income from maize cultivation was Rs.7645.18. Thus the benefit cost ratio was found to be 1:1.15. The results indicate that, the total cost of cultivation for sunflower was Rs. 37226.95. The gross income realized by the farmers was Rs. 58951.17. The net income from sunflower cultivation was Rs. 21724.22. Thus the benefit cost ratio was found to be 1:1.58.

The results indicate that, 37.84 per cent of the households opined that dry fodder was adequate and 43.24 per cent of the households opined that green fodder was adequate.

The results indicate that the annual gross income was Rs. 52,857.14 for landless farmers, for marginal farmers it was Rs. 79,121.43, for small farmers it was Rs. 88,395, for semi medium farmers it was Rs. 118,570 and for medium farmers it was Rs. 75,000.

The results indicate that the average annual expenditure is Rs. 7,554.34. For landless households it was Rs. 6,020.41, for marginal farmers it was Rs. 3,974.49, for small farmers it was Rs. 5,572.50, for semi medium farmers it was Rs. 16,000 and for medium farmers it was Rs. 46,000.

The results indicate that, sampled households have grown 80 coconut tree and 1 mango trees in the field. Also, 1 coconut tree in the backyard. The results indicate that, households have planted 16 teak and 65 neem trees in their field.

The results indicated that, bajra was sold to the extent of 100 per cent, Bengal gram was sold to the extent of 93.75 per cent and cotton, green gram, groundnut, maize, and sunflower was sold to the extent of 100 per cent.

The results indicated that, about 78.38 per cent of the farmers sold their produce to local/village merchants and 2.70 per cent of their produce to regulated markets. The results indicated that, 81.08 per cent of the households have used tractor as a mode of transportation for their agricultural produce.

The results indicated that, 62.16 per cent of the households have experienced soil and water erosion problems in the farm. The results indicated that, 78.38 per cent have shown interest in soil test.

The results indicated that, 83.72 per cent of the households used firewood and 16.22 per cent used LPG as a source of fuel. The results indicated that, piped supply was the major source of drinking water for 89.19 per cent and bore well and lake/tank was the source of drinking water for 5.41 per cent of the households in the micro watershed. Electricity was the major source of light for 100 per cent of the households in micro watershed.

The results indicated that, 54.05 per cent of the households possess sanitary toilet. The results indicated that, 97.30 per cent of the sampled households possessed BPL card. The results indicated that, 24.32 per cent of the households participated in NREGA programme.

The results indicated that, cereals were adequate for 100 per cent of the households, pulses were adequate for 91.89 per cent, vegetables and fruits were adequate for 5.41 per cent, milk and meat was adequate for 97.30 per cent and eggs were adequate for 94.59 per cent.

The results indicated that, pulses were inadequate for 8.11 per cent, oilseed were inadequate for 97.30 per cent, vegetables and fruits were inadequate for 94.59 per cent, milk and eggs were inadequate for 2.70 per cent of the households.

The results indicated that, lower fertility status of the soil was the constraint experienced by 81.08 per cent of the households, wild animal menace on farm field, frequent incidence of pest and diseases, inadequacy of irrigation water, high cost of fertilizers and plant protection chemicals was the constraint experienced by 78.38 per cent of the households, high rate of interest on credit (62.16%), low price for the agricultural commodities (56.76%), lack of marketing facilities in the area (29.73%), inadequate extension services (18.92%), lack of transport for the safe transport of agricultural produce to the market (10.81 %) and source of agri technology information (2.70 %).